APPENDIX 6.4.6-A

Heritage Resources Impact Mitigation Report

November 2010

CELEBRATING 50 YEARS in 2010

APPENDIX III

Shore Gold Inc.
Star-Orion South Diamond Project
Heritage Resources Impact Mitigation

Submitted to:
Ethan Richardson
Shore Gold Inc.
Suite 300, 224 - 4th Avenue South
Saskatoon, Saskatchewan
S7K 5M5

REPORT

A world of capabilities delivered locally

Report Number: 10-1361-0045
Distribution:

1 Copy - Shore Gold Inc.,
Saskatoon, Saskatchewan
1 Copy - Heritage Resources Branch,
Regina, Saskatchewan (+CD)
1 Copy - Royal Saskatchewan Museum,
Regina, Saskatchewan
2 Copies - Golder Associates Ltd.,
Saskatoon, Saskatchewan

Golder Associates

Credits

Senior Review	Grant Clarke, M.A.
Project Manager	Brad Novecosky, M.A.
Permit Holder	Brad Novecosky, M.A.
	Patrick Young, M.A.
Report Author	Brad Novecosky, M.A.
	Patrick Young, M.A.
	Michael Markowski, M.A.
	Katie Zdunich, B.A.
Field Investigator	Brad Novecosky, M.A.
	Patrick Young, M.A.
	Michael Markowski, M.A.
	Katie Zdunich, B.A
	Kris Sullivan, B.A.
	Luke Ryalls, B.A.
	Steve Killick, B.A.
	Alan Korejbo, B.A.
	Frank Constant (James Smith Cree Nation)
Technical Assistance	Amanda Karras, B.Sc.
	Scott Bailey, B.A.
	Michael Dennis
	David Hipwell
	Leona Gates

Executive Summary

Golder Associates Ltd. completed a Heritage Resources Impact Mitigation of 28 archaeological sites identified in conflict with the proposed Star-Orion South Diamond Project located in the Fort à la Corne Provincial Forest. The mitigation was carried out under Archaeological Resource Mitigation Permits No. 08-145 and No. 10-237 issued by the Heritage Resources Branch.

Excavation proceeded in a staged approach at selected sites. Phase I excavation was completed at all 28 sites (FhNe 11, 12, 14, 26, 27, 31, 34, 36, 45, 46, 49/104, 74, 77, 82, 87, 88, 90, 91, 98, 102, 115, 120, 126, 135, 138, 143, and 155 and FhNf 59) and consisted of a maximum of 10 m^2 of excavation. Phase II proceeded at seven of these sites (FhNe 11, 82, 88, 98, 115, 120, and 138) where an additional 10 m^2 or a combined 20 m^2 were excavated. Phase III occurred at two sites that demonstrated the highest potential for scientific interpretation. An additional 60 m^2 or a total of 80 m^2 were excavated at these sites (FhNe 11 and 88).

A total of 411.25 m^2 were excavated during the mitigation program and 60,274 artifacts were recovered. Ten heritage resources produced culturally diagnostic projectile points ranging from Early Side-notched to non-distinct Late Side-notched points spanning approximately 7,500 to 200 years ago. However, when results from the mitigation are combined with previous assessments in the Fort à la Corne Provincial Forest, it is apparent the region was occupied from the Palaeo-Indian Period (beginning approximately 9,000 years ago) through to the Late Precontact/Woodland Period, with the majority of sites dating to the Middle Precontact Period (7,500 to 2,000 years ago).

Excavations further indicate that lithic reduction and tool production was the primary activity occurring at sites. Debitage was the dominant artifact class, and accounts for over 92% of all artifacts recovered. Although there is evidence for food processing at some of the campsites, it is on a limited scale. There is little evidence for extensive hearth or boiling pit features or large amounts of calcined/burnt bone that is typical of larger scale communal hunting/processing activities. This suggests that Precontact peoples were travelling through the study area to the Saskatchewan River to collect raw lithic materials (primarily Swan River Chert), and then transporting it further inland. As people were moving through the Fort à la Corne Provincial Forest along the many ravines, they were stopping to further reduce the raw material into blanks and tools. These stops may have ranged between a few hours to a few days, and certain locations such as FhNe 88 were repeatedly occupied through the millennia.

Table of Contents

1.0 INTRODUCTION **1**

2.0 MITIGATION METHODOLOGY **1**

2.1 Excavation 2

2.2 Artifact Analysis and Cataloguing 2

3.0 RESULTS **4**

3.1 Phase I Mitigation 7

3.1.1 FhNe 12 7

3.1.2 FhNe 14 14

3.1.3 FhNe 26 16

3.1.4 FhNe 27 18

3.1.5 FhNe 31 21

3.1.6 FhNe 34 23

3.1.7 FhNe 36 24

3.1.8 FhNe 45 29

3.1.9 FhNe 46 30

3.1.10 FhNe 49 32

3.1.11 FhNe 74 34

3.1.12 FhNe 77 37

3.1.13 FhNe 87 39

3.1.14 FhNe 90 40

3.1.15 FhNe 91 42

3.1.16 FhNe 102 43

3.1.17 FhNe 126 45

3.1.18 FhNe 135 48

3.1.19 FhNe 143 50

3.1.20 FhNe 155 52

3.1.21 FhNf 59 53

3.2 Phase II Mitigation 57

3.2.1 FhNe 82 57
3.2.2 FhNe 98 61
3.2.3 FhNe 115 64
3.2.4 FhNe 120 66
3.2.5 FhNe 138 69
3.3 Phase III Mitigation 73
3.3.1 FhNe 11 73
3.3.2 FhNe 88 82
4.0 INTERPRETATIONS 91
4.1 Culture History Interpretations 91
4.1.1 The Early Precontact Period 92
4.1.2 The Middle Precontact Period 93
4.1.3 The Late Precontact/Woodland Period 97
4.2 Lithic Analysis 99
4.3 Faunal Analysis/Subsistence 103
4.4 Landscape Utilization 106
5.0 SUMMARY 107
6.0 CLOSURE 108
7.0 REFERENCES 109

TABLES

Table 1: Summary of Excavation Results 4
Table 2: Summary of All Artifacts Recovered from FhNe 12 11
Table 3: Summary of Lithic Materials from FhNe 14 15
Table 4: Summary of Lithic Materials from FhNe 26 18
Table 5: Summary of Lithics from FhNe 27 21
Table 6: Summary of Lithic Materials from FhNe 31 22
Table 7: Summary of Lithics from FhNe 34 26
Table 8: Summary of Artifacts from FhNe 36 Area A 28
Table 9: Summary of Lithic Materials from FhNe 45 30
Table 10: Summary of Lithic Materials from FhNe 49 33

Table 11: Summary of Lithic Materials from FhNe 74 35
Table 12: Summary of Lithic Materials from FhNe 77 38
Table 13: Summary of Lithic Materials from FhNe 90 41
Table 14: Summary of Lithic Materials from FhNe 91 43
Table 15: Summary of Lithic Materials from FhNe 102 45
Table 16: Summary of Lithic Materials from FhNe 126 Area A 47
Table 17: Summary of Lithic Materials for FhNe 126 Area B 48
Table 18: Summary of Lithic Materials from FhNe 135 50
Table 19: Summary of Lithic Materials from FhNe 143 51
Table 20: Summary of Lithic Materials from FhNe 155 53
Table 21: Summary of Lithics from FhNf 59 55
Table 22: Summary of Lithic Materials from FhNe 82 Area A 59
Table 23: Summary of Lithic Materials from FhNe 82 Area B 60
Table 24: Summary of Lithic Materials from FhNe 98 62
Table 25: Summary of Lithic Materials from FhNe 115 65
Table 26: Summary of Lithic Materials from FhNe 120 68
Table 27: Summary of Lithic Materials from FhNe 138 71
Table 28: Summary of Lithic Materials from FhNe 11 76
Table 29: Summary of Tools from FhNe 11 77
Table 30: Summary of Lithic Materials from FhNe 88 84
Table 31: Summary of Tools from FhNe 88 86
Table 32: Summary of Identifiable Projectile Points from FhNe 88 90
Table 33: Summary of Heritage Resources with Culturally Diagnostic Tools/Projectile Points 91
Table 34: Selected Cody Radiocarbon Dates 93
Table 35: Selected Early Side-notch Radiocarbon Dates 94
Table 36: Selected Oxbow Radiocarbon Dates 95
Table 37: Selected McKean Radiocarbon Dates 96
Table 38: Selected Pelican Lake Radiocarbon Dates 96
Table 39: Selected Besant Radiocarbon Dates 97
Table 40: Selected Avonlea Radiocarbon Dates 98
Table 41: Summary of Lithic Materials from Project Area 100
Table 42: Debitage Reduction Stages Represented at Select Sites by Frequency 102
Table 43: Debitage Reduction Stages Represented at Select Sites by Percentage 103

Table 44: Summary of Faunal from Excavated Sites by Frequency 104

FIGURES

Figure 1: Location of Known Heritage Resources Recommended for Phase I Mitigation in Star-Orion South Diamond Project Area 6

Figure 2: Location of Known Heritage Resources Recommended for Phase II Mitigation in Star-Orion South Diamond Project Area 58

Figure 3: Location of Known Heritage Resources Recommended for Phase III Mitigation in Star-Orion South Diamond Project Area 74

PHOTOS

Photo 1: View across FhNe 12 7

Photo 2: View of cook stove with maker's mark 8

Photo 3: Looking north across FhNe 12 and test units 9

Photo 4: South wall profile of 203N 192E showing wood from floorboard or collapsed wall 10

Photo 5: View of west wall of 206N 193E showing mound foundation feature 10

Photo 6: 1926 five-cent piece from FhNe 12 12

Photo 7: Taking a tree core sample with an increment bore at FhNe 12 13

Photo 8: A tree core sample from FhNe 12 13

Photo 9: View of FhNe 14 14

Photo 10: Biface fragment from FhNe 14 15

Photo 11: View of FhNe 26 17

Photo 12: Excavation block at FhNe 26 17

Photo 13: View of FhNe 27 20

Photo 14: Excavation block at FhNe 27 20

Photo 15: View of FhNe 31 22

Photo 16: End/Side scraper from FhNe 31 23

Photo 17: View of FhNe 34 25

Photo 18: View of excavations at FhNe 34 25

Photo 19: End scraper recovered from FhNe 34 26

Photo 20: View of FhNe 36 Area A 27

Photo 21: Excavation block at FhNe 36 Area A 27

Photo 22: View of FhNe 36 Area B 29

Photo 23: View of FhNe 45 30

Photo 24: End/Side scraper from FhNe 45 31

Photo 25: View of FhNe 46 31
Photo 26: View of FhNe 49 32
Photo 27: Projectile point base from FhNe 49 33
Photo 28: View of FhNe 74 34
Photo 29: Tools from FhNe 74 36
Photo 30: Hammerstone from FhNe 74 (Cat. #612) 37
Photo 31: View of FhNe 77 38
Photo 32: View of FhNe 87 39
Photo 33: View of FhNe 90 40
Photo 34: Tools from FhNe 90 41
Photo 35: View of FhNe 91 42
Photo 36: View of FhNe 102 44
Photo 37: Bifaces from FhNe 102 46
Photo 38: View of FhNe 126 Area A 46
Photo 39: Tools from FhNe 126 Area A 48
Photo 40: View of FhNe 135 49
Photo 41: View of FhNe 143 51
Photo 42: View of FhNe 155 52
Photo 43: View of FhNf 59 53
Photo 44: Excavation block at FhNf 59 55
Photo 45: Corner notched projectile point base from FhNf 59 56
Photo 46: Biface fragment from FhNf 59 56
Photo 47: View of FhNe 82 Area A 57
Photo 48: Tools from FhNe 82 60
Photo 49: View of FhNe 98 61
Photo 50: Tools from FhNe 98 63
Photo 51: View of FhNe 115 64
Photo 52: Tools from FhNe 115 66
Photo 53: View of FhNe 120 67
Photo 54: Heath Feature in 200N 198E 68
Photo 55: Tools from FhNe 120 69
Photo 56: View of FhNe 138 70
Photo 57: Tools from FhNe 138 72

Photo 58: Stratigraphy at FhNe 138 72
Photo 59: View south across FhNe 11 from Spy Hill 75
Photo 60: View of Spy Hill from FhNe 11 Block B 75
Photo 61: View of FhNe 11 Block A 76
Photo 62: Scrapers from FhNe 11 78
Photo 63: Scrapers from FhNe 11 78
Photo 64: Scrapers from FhNe 11 79
Photo 65: Bifaces from FhNe 11 80
Photo 66: Hammerstone form FhNe 11 (Cat. #26436) 81
Photo 67: Projectile Points from FhNe 11 82
Photo 68: View northwest across FhNe 88 83
Photo 69: View southeast across FhNe 88 Block A 84
Photo 70: End scrapers from FhNe 88 86
Photo 71: Bifaces from FhNe 88 87
Photo 72: Hammerstone from FhNe 88 (Cat. #3985) 88
Photo 73: Projectile Points from FhNe 88 89
Photo 74: Projectile Points from FhNe 88 89
Photo 75: Reverse face of heavily reworked quartz Cody knife 92

APPENDICES

APPENDIX A
FhNe 12 Site Sketch Map

APPENDIX B
Artifact Density Plots

APPENDIX C
Tool Metrics

1.0 INTRODUCTION

Golder Associates Ltd. (Golder) conducted a Heritage Resources Impact Mitigation (HRIM) of select sites found in conflict with the proposed Star-Orion South Diamond Project located in the Fort à la Corne (FALC) Provincial Forest. This report summarizes the mitigation program carried out for heritage resources identified in the proposed facilities footprint.

Heritage Resources Impact Assessments (HRIA) were carried out in conjunction with advanced diamond exploration in the FALC Provincial Forest since 2004 (Golder 2005, 2006a to 2006b, 2007a to 2007f, 2008a to 2008d, and 2009; Western Heritage Services Inc. [Western Heritage] 2006 and 2007), culminating in HRIA specifically for the Star-Orion South Diamond Project in 2008 and 2010 conducted by Golder (2010a and 2010c). A total of 108 heritage resources were identified in conflict with the proposed project, the vast majority consisting of small lithic debitage find and scatter sites. These sites were rated based on their potential to provide information on past lifeways in the project area. As a result of this evaluation process, further excavation was recommended at 28 sites as part of a final mitigation program for the Star-Orion South Diamond Project. A summary of previous HRIA work and heritage resources identified in the study area is provided in the Archaeology Baseline Report located in Appendix II.

The following report provides a summary of the mitigation carried out by Golder in 2008 and 2010 (2010b and 2010c). Section 2 describes mitigation methodology. Section 3 details the mitigation results. Section 4 discusses interpretations, and Section 5 provides a summary. Select site sketches are found in Appendix A, artifact density plots for Phase II and Phase III mitigation is found in Appendix B, and tool metric attributes are presented in Appendix C.

2.0 MITIGATION METHODOLOGY

As discussed in the Archaeology Baseline Report (Appendix II), the 108 sites identified within the project footprint were evaluated for heritage significance or interpretational potential. Using scientific criteria, as well as input from the Heritage Resources Branch, these sites were rated based on their potential to provide information on past lifeways in the project area.

The majority of sites (n=80 or 74%) consist of small artifact find and scatter sites with a light artifact density. They were considered to have low potential and limited knowledge would be gained through additional excavation at these sites. They are considered adequately mitigated through previous assessment programs, collection of formed tools, site mapping, and submission of Saskatchewan Archaeological Resource Record (SARR) forms to the Heritage Resources Branch.

The remaining 28 heritage resources consist of high (n=9) and moderate (n=19) potential sites where the potential to increase understanding of past lifeways in the project area was considered greater. The sites were selected based on the presence of a significant surface scatter with the potential for, or evidence of, intact deposits; the presence of a variety of artifact classes or diagnostic artifacts; or evidence for potential features such as hearths or boiling pits. A three phase mitigation program was proposed for these sites.

Phase I consisted of a maximum of 10 m^2 of excavation at each site to further determine site structure and content, and identify specific activity areas or features. Upon completion of Phase I, if it was determined a site did not meet the significance criteria, no further work was recommended. If artifact yields or evidence for

features was insufficient to warrant further investigation, excavation could cease prior to the completion of the full 10 m^2. However, if activity areas/features were identified, Phase II was recommended.

Phase II consisted of an additional 10 m^2 of excavation resulting in a maximum of 20 m^2 excavated at each site. These units were used to expand existing excavations around known activity areas or features. It was anticipated that this phase would represent the final mitigation at most sites, with no further work required. However, data from this phase could be used to devise an appropriate excavation strategy for Phase III, where necessary.

Phase III only occurred at sites that demonstrated the highest scientific and interpretational value. It was anticipated that only a small number of sites would meet this criteria. The details of the required excavation would be site-specific and devised in conjunction with the Heritage Resources Branch.

The results at the completion of each phase were discussed with the Heritage Resources Branch to determine whether a site required further mitigation strategies as outlined in the preceding phase, or whether the results were sufficient to have fully mitigated the site against potential impacts.

2.1 Excavation

Excavation at each site proceeded by first establishing a site grid. A datum point was selected at a suitable location and a metal rebar stake was pounded into the ground. Each site datum was then arbitrarily identified and marked as 200N 200E with a wooden stake painted fluorescent orange. Depending on the local topography and vegetation of the site area, a north-south or east-west baseline was established according to true north, using a combination of compass and handheld GPS. The datum for each site was subsequently recorded by a surveyor from Golder using a base station and Sokkia GPS instrumentation for greater accuracy.

Excavation units were measured-in off the established base line using triangulation methods with a chain and tape measure. Each excavation unit was identified by the southwest corner according to a north and east grid coordinate established by the site datum. Each 1 m^2 unit was then divided into 50 cm quadrants. Prior to excavation, a transit and rod was used to record the surface elevation of each unit at the corners of each quadrant, or a total of nine points per unit. This data could be used in relation to the site datum to calculate the actual elevation above sea level. Excavation then proceeded according to quadrant by shovel in 10 cm arbitrary levels below ground surface. All soils were passed through a ¼-inch (6 mm) hand screen mounted to tripods to maximize the recovery of cultural materials. In some instances, larger artifacts such as concentrations of fire-cracked rock (FCR) were left *in situ* and mapped on a planview. Detailed level records were kept and artifact provenience recorded according to quadrant and level. Excavation was complete when all occupation levels were excavated through to culturally sterile levels. A stratigraphic profile drawing and a digital photograph was then taken of each unit.

2.2 Artifact Analysis and Cataloguing

In order to process the large amount of artifact data generated by the excavations, a catalogue program was created in Microsoft Office Access 2007. This database enabled all artifact descriptions and provenience information to be recorded and queried for subsequent analysis. Each artifact or cluster of artifacts was identified according to artifact class (i.e., bone, lithic, FCR), sorted by size, counted, weighed, and provenience location recorded. An artifact card was then generated and each artifact or cluster was placed in a plastic

zip-lock bag with the artifact card. Stone tools were photographed and metric attributes recorded with digital callipers.

ArcView GIS software was used to create a map for sites where Phase II and Phase III mitigation occurred. This allowed data from the catalogue to be imported directly into the map according to unit provenience to create artifact density plots by quadrant. Because all site datums were geo-spatially referenced, this also allowed microtopographic information for each site area to be imported from LIDAR data (made available by Shore Gold Inc. [Shore]).

The overwhelming majority of artifact recoveries from sites in the project area consist of lithic debitage. Debitage is the debris resulting from the manufacture of lithic tools. For the purpose of this analysis, Brian Kooyman's (2000) debitage classification was employed. Two forms of debitage are recognized: flakes and shatter. Kooyman (2000:172-173) defines flakes as follows:

> *...a piece of lithic material usually intentionally detached from another piece of lithic material (such as a core, a tool, etc.), with a series of features showing that it has a definable original outer surface and a newly created inner surface, as well as a place where the detaching blow was struck (e.g. bulb of percussion, ripple marks, striking platform, arris) […]*

This broad category of flakes can be further subdivided into sub-categories based on specific attributes. Flakes produced at the various stages of tool production, from the original raw cobble or core through to a finished tool, each have specific characteristics. Defined stages include early, middle, and late, and can indicate what type of lithic reduction activities were occurring at a site (Kooyman 2000). Flakes from sites excavated in the project area were classified according to these stages and are defined below.

- Early Stage - flakes typically have cortex, are large and thick, and exhibit little dorsal scarring.
- Middle Stage - Shaping: flakes are typically small, short, have a rounded outline and little dorsal scarring.
- Middle Stage - Thinning: flakes are typically thin, elongate, exhibit a medium exterior platform angle, no lip, and medium dorsal scarring.
- Late Stage - Bifacial Reduction: flakes are typically thin, elongate, exhibit an acute exterior platform angle, a lip, and complex dorsal scarring.
- Late Stage - Finishing: flakes are typically small, short, may have acute exterior platform angle, lip, and exhibit complex dorsal scarring.

An additional category of flake fragment was also created. This included flakes that were broken or incomplete (i.e., proximal, distal, or lateral fragment). In these instances, a specific reduction stage could not be recognized.

The second form of debitage recognized is shatter. Kooyman (2000:176) describes shatter as:

> *a piece of lithic material generally detached inadvertently from another piece of lithic material (core or other piece of material such as a tool) when intentionally trying to detached another piece of lithic material (a flake); produced by the shattering of the piece from which it was struck.*

This unintentional bi-product of lithic reduction consists of fragments that are generally blocky and angular in shape, that lack distinct flake characteristics such as a striking platform or a bulb of percussion.

3.0 RESULTS

The HRIM was conducted between June 10 and November 12, 2008 under Permit No. 08-145 (Golder 2010b), and September 2 to 6, 2010 under Permit No. 10-208 (Golder 2010c) issued to Brad Novecosky and Patrick Young (archaeologists, Golder). A total of 411.25 m^2 were excavated at 28 sites, and 60,274 artifacts recovered (Table 1).

Table 1: Summary of Excavation Results

Borden No.	Total m² Excavated	Total Artifact Count	Artifacts (m²)	Features	Diagnostic Projectile Points from Mitigation	Diagnostic Projectile Points from Previous Assessment	Typology
FhNe 11	80	26,304	328.8	-	3	-	McKean Complex
FhNe 12	3	102	34	1 cabin	-	-	1926 five cent piece
FhNe 14	5	165	33	-	-	-	-
FhNe 26	10	933	93.3	-	-	-	-
FhNe 27	9	390	43.3	-	-	2	Late Side-notched
FhNe 31	6	154	25.6	-	-	-	-
FhNe 34	6	70	11.6	-	-	1	Late Side-notched
FhNe 36	8	350	43.75	-	-	-	-
FhNe 45	6	15	2.5	-	-	-	-
FhNe 46	5	0	0	-	-	-	-
FhNe 49	10	1,193	119	-	1	-	Indet. Base Fragment
FhNe 74	10	3,207	320.7	-	-	-	-
FhNe 77	6	131	21.8	-	-	-	-
FhNe 82	20	1,906	95.3	-	1	0	Pelican Lake
FhNe 87	4	0	0	-	-	-	-
FhNe 88	80	8,954	111.9	-	12	3	3 Late Side-notched 1 Besant 2 Pelican Lake 4 McKean Complex 1 Oxbow Preform 1 Preform 1 Indet. Base (Hanna?) 2 Indet. Body Fragments
FhNe 90	7	240	34.3	-	-	1	McKean Complex
FhNe 91	8.25	98	11.8	-	-	-	-
FhNe 98	20	3,174	158.7	-	-	1	Early Side-notched
FhNe 102	10	1,374	137.4	-	-	-	-
FhNe 115	20	4,023	201.1	-	1	1	McKean Complex
FhNe 120	20	899	45	1 Boiling Pit	1	-	Early Side-notched
FhNe 126	8	143	17.8		-	-	-

FhNe 135	8	3,296	412.4		-	-	-
FhNe 138	20	1,213	60.6		-	-	-
FhNe 143	8	1,375	178.9		-	-	-
FhNe 155	4	4	1		-	-	-
FhNf 59	10	561	56.1	-	1	-	Pelican Lake
Total	**411.25**	**60,274**	**n/a**	**2**	**20**	**9**	**-**

The sites selected for mitigation include 13 located in the proposed Overburden Storage Area, 13 within the Star Open Pit, one within the original boundaries of the Orion South Open Pit, and one within the boundaries of the original Plant Site. From a landscape perspective, 10 heritage resources are located along the 101 Ravine, 10 along the East Ravine and related tributaries, three on the West Ravine, and five located at inland locations including a local landform known as Spy Hill.

Phase I was completed at all 28 sites and consisted of a maximum of 10 m^2 of excavation (Figure 1). Phase II proceeded at seven sites where an additional 10 m^2 or a combined 20 m^2 were excavated to expand around known activity areas or potential features (FhNe 11, 82, 88, 98, 115, 120, and 138). Phase III occurred at two sites that demonstrated the highest potential for scientific interpretation. An additional 60 m^2 or a total of 80 m^2 were excavated at these sites (FhNe 11 and 88).

Prior to discussing the excavation results, an observation should be made regarding the stratigraphy in the project area. As has been discussed in previous HRIA reports (Golder 2005a to 2005b, 2006a to 2006c, 2007a to 2007f, 2008a to 2008d, and 2009a to 2009b), the stratigraphy in the stabilized sand dune environment of the FALC Provincial Forest is not complex. It consists of a thin organic layer followed by a grey sand layer, then yellow sand through to at least 100 cm. It can be summarized as follows:

- 0 cm to 2 cm organic;
- 2 cm to 5 cm grey sand; and
- 5 cm to 100+ cm yellow sand.

Artifacts at most sites were typically found in Levels 2 and 3 (10 cm to 20 cm and 20 cm to 30 cm below surface). There was no visible separation of occupation levels based on stratigraphic layers, as all were located in the yellow sand, nor by differential artifact density according to arbitrary levels. Most sites appear to be single occupation events representing discrete activity areas. However, interpretations are problematic as the sand matrix facilitates the vertical displacement of artifacts and, as will be discussed for FhNe 88, there is evidence for collapsed or mixed stratigraphy in some instances, resulting in thousands of years of occupation in one horizon. This makes interpretations based on different episodes of occupation impossible. As a result, the artifacts from each site are discussed as one assemblage.

Figure 1: Location of Known Heritage Resources Recommended for Phase I Mitigation in Star-Orion South Diamond Project Area

3.1 Phase I Mitigation

All 28 sites were subject to Phase I mitigation or a maximum of 10 m^2 (Figure 1). This was a test excavation phase to determine if significant, intact deposits or the potential for features representing complex activity areas were present. For the majority of sites (n=21), this was the final mitigation phase with excavation ceasing prior to the completion of 10 m^2. In most instances artifact density and variety was insufficient to warrant further excavation. In other instances, although there was significant artifact density, there was no variety in artifact class (i.e., only debitage) and it was decided to abandon these sites in favour of more complex sites with the potential for greater interpretation. The 21 sites that received only Phase I mitigation are discussed below, the remaining seven sites are discussed in subsequent sections of this report.

3.1.1 FhNe 12

FhNe 12 is an historic artifact/feature combination site originally identified during assessment of Kimberlite Body 145 under Permit No. 04-102 (Golder 2005). The site is located toward the northwest boundary of the Orion South Pit, approximately 800 m northwest of the tributary of the East Ravine. Identified at FhNe 12, were the remains of a cabin foundation immediately north of an overgrown vehicle trail (Photo 1).

Although no structural materials remained at the feature, a raised outline was clearly visible. Surrounding this feature were pits along three of the walls. A scatter of historic artifacts was also observed on the surface. These included seven ferrous cans, one clear glass jar, one ferrous chimney stove pipe fragment, and the pieces of a “McClary’s Famous” cook stove (Photo 2).

Photo 1: View across FhNe 12

Photo 2: View of cook stove with maker's mark

A sketch map of the site was made, but no shovel testing was carried out. The cabin was staked and flagged for avoidance with the recommendation that subsurface testing and detailed feature mapping be carried out if the site was to be impacted.

FhNe 12 was revisited on September 19, 2008 as part of the assessment of the Orion South Pit under Permit No. 08-093. Subsurface testing was carried out at the site with the excavation of three 40 cm by 40 cm shovel probes. One test was placed within the cabin and was the only one to produce artifacts. In addition to a piece of metal wire, a 1926 five-cent coin was recovered from 0 cm to 17 cm below surface.

Given the potential for the site to pre-date the Second World War, it was decided that feature mapping and controlled test excavation was required. The site was returned to on November 13, 2008. A light snow fall of approximately 1 cm covered the ground; however, surface features were still visible. A site datum was established at 200N 200E southeast of the southeast corner of the cabin. A chain was then strung along a base line oriented to true north to assist measuring in the cabin feature and test units.

The cabin feature was oriented almost perfectly square with true north. A 1 m wide opening in the foundation mound suggests that the door was facing south toward the overgrown trail, which is oriented southwest to northeast. The cabin measures approximately 4.5 m north-south and 5.5 m east-west (Appendix A). The earthen mounds measure approximately 0.7 m wide. Surrounding this feature are three 50 cm to 80 cm deep pits, which vary in size from 1.8 m to 3.4 m in diameter. These elongate pits are found along the north, east and west wall. The McClary cook stove was located toward the southeast corner of the cabin.

A metal detector survey was conducted over the site area to help determine the placement of the shovel tests and to locate potential midden features. The results of the metal detection indicated that there were no areas with a particularly high metal reading, including the depressions. However, there was a slightly higher reading within the cabin and immediately outside the door to the cabin.

Three 1 m^2 units were measured-in off the baseline using the triangulation method (Photo 3). It was decided to place one unit (201N 194E) immediately south of the cabin just off the door. A second test (203N 192E) was placed inside the cabin expanding on the previous positive shovel test, and the third was placed across the north foundation mound (206N 193E). Each unit was excavated in quadrants and 10 cm levels with a shovel, and the soil matrix was screened through ¼" (6 mm) mesh screens. Wooden floorboards or wood from the wall collapse was identified approximately 15 cm to 20 cm below surface in 203N 192 E within the cabin (Photo 4). A profile of the cabin foundation in 206N 193E illustrates the level of sand deposition overtop of the original ground surface, mounded against the exterior of a wooden wall sill (Photo 5). The depressions found adjacent to the walls appear to be the result of cabin construction and the formation of these mounds.

Photo 3: Looking north across FhNe 12 and test units

Photo 4: South wall profile of 203N 192E showing wood from floorboard or collapsed wall

Photo 5: View of west wall of 206N 193E showing mound foundation feature

A total of 102 artifacts were recovered from the test units and surface (Table 2). The majority of artifacts came from the test within the cabin (n=53) followed by the test outside the cabin adjacent to the door (n=42). Only four fragments of wire were found along the foundation wall. Pieces of cast iron from the stove were found immediately below the organic level in 201N 194 E, which would explain the high metal reading from the metal detector. Wire nails, tin cans, and tin can fragments dominated the assemblage, followed by glass sherds and containers. Bone, including a portion of a scapula from a large ungulate and unidentified calcined fragments, were found in the unit outside the door.

Table 2: Summary of All Artifacts Recovered from FhNe 12

Artifact Type	Frequency	Notes
Jar	1	Dominion Glass (1945)
Bottle	1	"U D CO" with an inverted triangle above and a number "3" below
Square glass bottle (refit)	2	
Glass Lid	1	
Glass Fragments	17	
Coin	1	1926 five-cent piece
Wire	2	
Wire nail	23	
Can	3	Sanitary can, double side-seam
Can Top	3	Sanitary can top
Copenhagen Tin Lid	2	"Copenhagen Satisfies" with logo
Spoon	1	
Tin Can Fragments	16	
Foil	4	Unid. foil packaging
I.D. Bone	1	Ungulate scapula fragment (L), cut marks
Calcined bone	18	
Unburnt Bone	4	
Burnt Wood	1	
Swan River Chert	1	Flake
Total	**102**	

Although it is difficult to determine the exact age of the cabin, there are some absolute and approximate dates on a number of artifacts that indicate a potential occupation range. The cast iron cook stove reads "McLary's Famous" on the side, "No. 9" located on the top of the stove, and "Brandon" with an image of flowers in a vase located on the side door (Photo 2). The make and model of this wood burning stove was manufactured as early as 1890 by the McClary Manufacturing Co. (Canadian Antique Stoves 2004). The McClary Manufacturing Co. business was established by J. and O. McClary in 1840. The manufacturing works were located in London, Ontario, with branch houses situated in Toronto, Montreal, and Winnipeg (M.G. Bixby and Co. 1886). The company engaged in an extensive trade, reaching England and Australia among other locations.

The presence of round nails used in cabin construction likely dates the cabin to the 20th Century. Large scale production of wire nails did not begin until the 1880's and became the most commonly used nail by the 1890s (Sutton and Arkush 2006). Similar to the nails, modern cans recovered from the site are of the "sanitary" type. These cans, with crimped seams, began to be mass manufactured by the early 1900s and continue through to present day (Sutton and Arkush 2006). Other metal artifacts include portions of two Copenhagen tin lids for

snuff containers. These metal lids were manufactured for fibre board snuff boxes and distributed in Canada throughout the 20th Century. The five-cent piece recovered from the shovel test has a date of 1926, which indicates introduction of this artifact to the site some time after that date (Photo 6).

Photo 6: 1926 five-cent piece from FhNe 12

Two glass containers were also collected from the surface of the site. This included a rectangular glass bottle of unknown age with a maker's mark consisting of the letters "U D GO" with an inverted triangle above, and a number "3" below. The second was a 24 oz. clear Dominion Glass jar with a maker's mark indicating a manufacture date of May/June 1945 and production at the Redcliff, Alberta factory.

In an attempt to obtain a minimum age for the cabin, tree core samples were taken from three trees growing within the cabin foundation. The cores were taken with an increment bore at breast height, or approximately 1.3 m above ground (Photos 7 and 8). The samples were brought back to the Golder office where they were examined internally by a forester. Based on the tree ring analysis, the sampled trees were estimated to be 32, 33, and 34 years old (M. Ferguson, pers. comm. 2009). The relatively young age of the trees likely relates to forest regeneration from the most recent fire that swept through the area.

An archival search was conducted of the Department of Natural Resources 1936 FAKC Provincial Forest map (SAB B.36/17), as well as the 1939 Fire Protection Map, Prince Albert District (SAB B.1/5). Although cabins are identified on these maps, no cabin is indicated in 36-49-20 W2M where FhNe 12 is located. The Forest Reserve was established in 1913, and the Forestry Branch, Department of the Interior Sessional Papers document the construction of patrol cabins or Ranger's Stations and roads within the Forest Reserve from 1913 through the 1920s (Western Heritage 2007). It seems unlikely that the cabin in question relates to these activities.

Based on the age of artifacts associated with the cabin and the age of the trees that have grown within the feature, one can estimate a maximum range of occupation. Most of the artifacts are relatively recent and appear to date to the 20th Century. The McClary cook stove found at the site may date as early as the 1890's, but was likely brought to the cabin for recycled use at a later date. The 1926 coin and 1945 jar may suggest occupation anywhere from the late 1920's through to the latter half of the 20th Century. Final destruction and abandonment of the cabin occurred no later than the mid-1970s.

Photo 7: Taking a tree core sample with an increment bore at FhNe 12

Photo 8: A tree core sample from FhNe 12

Based on the information (or lack there of) obtained from the archival maps, it is unlikely that the cabin represents a patrol station for the FALC Forest Reserve. Rather, it may relate to other activities carried out by locals during the early to late 20th Century. The test excavation and mapping has adequately mitigated impacts to this site and no further work is recommended.

3.1.2 FhNe 14

FhNe 14 is located on a gentle slope to the north of the West Ravine adjacent to a low-lying muskeg. The Saskatchewan River valley is located approximately 2.5 km south. The surrounding hummocky landscape is vegetated by aspen and willow. The site is partially disturbed by a bladed trail and a Shore Gold drill pad is located just to the south (Photo 9).

Photo 9: View of FhNe 14

FhNe 14 was first identified by Golder under Permit No. 05-038 (Golder 2006a) and was revisited under Permit No. 06-064 (Golder 2006b) during an HRIA for a proposed exploratory drill pad. Under the original assessment 27 shovel tests were excavated with five being positive for cultural materials. Three surface finds were also observed. Twelve artifacts in total were collected, which include Swan River Chert (SRC), quartz, and chert lithic debitage.

FhNe 14 was subject to Phase I mitigation, where 5 m^2 were excavated. A total of 165 artifacts were recovered, or an average of 33 artifacts per 1 m^2. Lithic materials dominate and account for 99% of the entire artifact assemblage (Table 3). One bone fragment was also recovered.

Table 3: Summary of Lithic Materials from FhNe 14

Material Type	Early: Reduction Flake	Middle: Shaping Flake	Middle: Thinning Flake	Late: Finishing Flake	Late: Bifacial Reduction	Flake Fragment	Shatter	Biface	Fire-cracked Rock	Total
Chalcedony						1	1			2
Chert		1					3			4
Granite									1	1
Quartz						2	2			4
Quartzite				1		3				4
Swan River Chert	12	22	18	22	3	41	30	1		149
Total	**12**	**23**	**18**	**23**	**3**	**47**	**36**	**1**	**1**	**164**

All lithic material found at the site is locally available, with SRC comprising approximately 91.5% of the assemblage. Quartzite, chert, and quartz were all found in similar numbers representing 7.5% of the assemblage. Two pieces of chalcedony were also collected from this site.

The lithic assemblage was comprised almost exclusively of debitage, including flakes (n=77), shatter (n=36), and unclassifiable flake fragments (n=47). The flakes represent all stages of lithic reduction including early (n=12), middle shaping (n=23), middle thinning (n=18), late finishing flakes (n=23), and bifacial reduction flakes (n=3). There was no significant difference in the ratio of flake types, which suggests that all stages of reduction were taking place at FhNe 14. One SRC biface fragment was recovered from FhNe 14 (Photo 10).

Photo 10: Biface fragment from FhNe 14

The remainder of the assemblage consisted of one piece of FCR (granite) and one unburnt long bone fragment from a large ungulate. Although these remains are often associated with a hearth feature, there was insufficient data to indicate such a feature was present at the site.

The presence of debitage and associated lithic tools suggests that FhNe 14 was utilized as a short term, lithic reduction area. Unfortunately, no diagnostic tools, features or identifiable bone were found at this site, which limits further interpretations. Given the light artifact density and previous disturbance of the site, no further mitigation was carried out.

3.1.3 FhNe 26

FhNe 26 is located on a slight ridge, approximately 1.5 km west and north of the West Perimeter Ravine and the 101 Ravine. The Saskatchewan River is located approximately 2.5 km southeast. The surrounding landscape consists of gently undulating terrain with scattered jack pine vegetation. The site is partially disturbed by a bladed trail.

FhNe 26 was first identified by Golder under Permit No. 05-038 (Golder 2006a) during an HRIA for the access road to 101 Kimberlite. A surface scatter consisting of 33 debitage of SRC and quartzite was observed along the road cut in a 40 m area. Sixteen shovel probes were placed in intact areas adjacent to the road. Three produced a total of seven debitage from 0 cm to 15 cm depth below surface (DBS). Given the potential for an intact component, the site was revisited for additional probing and artifact mapping that same year in advance of trail improvements. An additional five shovel probes were excavated in 10 cm levels adjacent to the road. Two of these probes produced nine artifacts from 0 cm to 10 cm DBS. The detailed mapping and probing program was followed by monitoring of road blading; however, no significant artifacts or features were identified in the right-of-way (ROW). The site was considered to have moderate interpretive value because of the intact component, and was thought likely to contain discrete activity areas. A recommendation was made for further assessment if future projects were to impact the site.

During Phase I mitigation of FhNe 26, an attempt was made to relocate the original positive shovel probes using the site sketch map from the SARR form and the UTM coordinates of known positive probes. During reconnaissance of the site area, old flagging tape identifying positive shovel probe H71 was identified, and additional positive and negative shovel probe depressions were located based on UTM coordinates.

A site datum was established and a north-south baseline was set up. Four 1 m^2 units were placed at 10 m intervals across the slight ridge where the site was identified; with two units placed on or adjacent to original positive shovel probes. One of these units was sterile and abandoned, while the other produced limited artifacts and was expanded to a 1 m by 2 m block. However, the northernmost unit, placed near a flake observed on the surface, was the most productive and was eventually expanded into a 2 m by 3 m block. The full 10 m^2 were excavated at FhNe 26 as part of the Phase I mitigation (Photos 11 and 12).

A total of 933 artifacts were recovered from the site, or an average of 93 artifacts per 1 m^2. Artifacts were recovered primarily from the bottom of Level 2 and top of Level 3, or approximately 15 cm to 25 cm below surface, and represent a single occupation. Units excavated to 40 cm DBS were sterile. Lithic debitage accounts for the entire artifact assemblage (Table 4). The majority of artifacts (91%) came from a discrete activity area in the 2 m by 3 m block.

The debitage consisted of flakes (n= 107), unclassifiable flake fragments (n=380), and shatter (n=446). The four stages of lithic reduction were represented, including early reduction (n=62), middle shaping (n=27), middle thinning (n=6), and late finishing flakes (n=12). There was no significant difference between the early-middle reduction stages, while a relatively low number of flakes represent the late reduction stage.

Photo 11: View of FhNe 26

Photo 12: Excavation block at FhNe 26

Table 4: Summary of Lithic Materials from FhNe 26

Material Type	Early: Reduction Flake	Middle: Shaping Flake	Middle: Thinning Flake	Late: Finishing Flake	Flake Fragment	Shatter	Total
Chalcedony	-	-	-	-	1	3	4
Chert	-	-	-	-		1	1
Gronlid Silstone	-	1	-	-	1	-	2
Knife River Flint	-	1	-	1	2	3	7
Quartz	-	-	-	-	-	16	16
Swan River Chert	62	25	6	11	376	423	903
Total	**62**	**27**	**6**	**12**	**380**	**446**	**933**

Almost all of the lithic material represented at FhNe 26 is locally available. SRC dominates and makes up 97% (n=903) of the assemblage. The remainder is represented by quartz 2% (n=16), chalcedony (n=4), Gronlid siltstone (n=2), and chert (n=1). A minor amount of exotic material is represented by Knife River Flint (n=7). Knife River Flint has a primary bedrock source in west-central North Dakota (Clayton et al. 1970; Fedirchuk and McCullough 1992:76). The presence of this exotic lithic material indicates it was either traded for or carried to the site from great distances.

Phase I mitigation at FhNe 26 identified a discrete lithic reduction area adjacent to the existing trail. The 2 m by 3 m block captured this activity area, with 54% of all artifacts recovered from three quadrants (SW of 229N 200E, NW of 228 N 200E, and SE of 229N 199E). The remaining test excavation units were either negative or produced a minor amount of debitage, suggesting the site was not extensive. The recoveries and distribution pattern at FhNe 26 is typical of sites found throughout the project area.

The overall artifact density of this site when compared with other sites in the project area where Phase II mitigation was recommended is light, and only one class of artifact (debitage) is present. No FCR or faunal remains were identified, nor any evidence for additional features. Given the generally light artifact density and absence of diagnostic tools, features, or identifiable bone, this site is considered to have limited interpretational value and no further work is recommended.

3.1.4 FhNe 27

FhNe 27 is located on a relatively level area, approximately 800 m west of the West Perimeter Ravine and 600 m northeast of FhNe 26. To the south of the site, the terrain begins to slope to a seasonal drainage. The surrounding hummocky landscape is vegetated with a mixture of aspen and brush near the drainage and jack pine in open areas. The Saskatchewan River is located approximately 2.5 km southeast. The site is partially disturbed by a bladed trail.

FhNe 27 was first identified by Golder under Permit No. 05-038 (Golder 2006a) during an HRIA of the 101 Kimberlite access. A surface scatter consisting of five debitage of SRC, Red River Chert, and quartz was observed along the road cut. Nine shovel probes were placed in intact areas adjacent to the road. One probe was positive producing 23 debitage from 0 cm to 10 cm DBS. Given the potential for an intact component, the

site was revisited for additional testing that same year in advance of trail improvements. An additional five shovel tests were excavated in 10 cm levels adjacent to the road. Two of these probes, excavated as a 1 m by 0.5 m unit, and placed immediately adjacent to the original positive probe, produced 39 artifacts. This included 28 debitage and nine highly fragmented bone pieces. Most significantly, however, was the recovery of fragments from two Late Side-notched projectile points. Material was observed from 0 cm to 40 cm below surface; however, it was observed that rodent disturbance was likely responsible for distributing artifacts to lower depths from the upper 20 cm. Both projectile points and bone fragments came from the rodent disturbance at lower depths.

The detailed testing program was followed by monitoring of road blading; however, no additional artifacts or features were identified in the ROW. Given the variety of lithic material, and presence of projectile points and bone fragments, the site was considered to have high interpretive value. A recommendation was made for further assessment if future projects were to impact the site.

During Phase I mitigation of FhNe 27, the original positive shovel probes were relocated using the site sketch map from the SARR form and the UTM coordinates of known positive probes. Remnant red flagging was present in the small aspen bluff immediately adjacent to the road near the location of positive shovel probes, but no evidence of the 1 m by 0.5 m test could be seen. However, one of the negative shovel probes immediately east of the positive probe was relocated. It then became evident that overburden from the previous road improvement had been deposited over the 2005 positive shovel probes, obscuring their location.

After determining the approximate location of the positive shovel probes, a site datum was established and an east-west baseline was set up across the site. A 2 m by 2 m excavation block was placed between the known negative probe and the road. The initial recoveries were minimal, but when the block was expanded east and south, the 2005 positive shovel probe was intercepted, and the activity area was identified. In the end, 9 m^2 were excavated at FhNe 27 as part of the Phase I mitigation (Photos 13 and 14).

A total of 390 artifacts were recovered, or an average of 43 artifacts per 1 m^2. Although it should be noted that 72% (n=283) of the artifacts came from the south half of 199N 183E and the north half of 198N 183E, the two units located immediately southeast of the 2005 positive probe. Overburden soil was screened separately from intact soil, and the overwhelming majority of artifacts were recovered from 0 cm to 10 cm DBS, with nominal amounts coming from lower levels. This seems to confirm that the occupation occurs in the upper 10 cm.

Lithic debitage accounts for the entire artifact assemblage (Table 5), and consists of flakes (n=40), unclassifiable flake fragments (n=221), and shatter (n=129). The flakes represent all stages of lithic reduction including early (n=28), middle shaping (n=9), middle thinning (n=1), and late finishing (n=2). Early reduction flakes appear to dominate classified debitage and may suggest that early stages of reduction were occurring.

All lithic material found at the site are locally available, with SRC comprising approximately 96% (n=376) of the assemblage. Fourteen pieces of quartz were also recovered and accounts for the remaining 4% of the assemblage.

Photo 13: View of FhNe 27

Photo 14: Excavation block at FhNe 27

Table 5: Summary of Lithics from FhNe 27

Material Type	Early: Reduction Flake	Middle: Shaping Flake	Middle: Thinning Flake	Late: Finishing Flake	Flake Fragment	Shatter	Total
Quartz	2	-	-	-	4	8	14
Swan River Chert	26	9	1	2	217	121	376
Total	**28**	**9**	**1**	**2**	**221**	**129**	**390**

Phase I mitigation confirmed that FhNe 27 is represented by a discrete lithic reduction area located immediately adjacent to the existing trail. The 2005 positive probes intersected the lithic concentration, and the 9 m^2 excavation block captured the rest of the activity area. The activity area dies out rapidly going east, and was confined to a small area approximately 1 m^2 in size. As indicated by original testing of the site, FhNe 27 is not extensive, but represented by a single, discrete lithic reduction area.

The overall artifact density of this site when compared with other sites in the project area where Phase II mitigation was recommended is light, and only one class of artifact (debitage) is present. No FCR or faunal remains were identified, nor any evidence for additional features. Given the generally light artifact density and absence of additional diagnostic tools, features, or identifiable bone, this site is considered to have limited interpretational value and no further work is recommended.

3.1.5 FhNe 31

FhNe 31 is located on a sand ridge that overlooks the 101 Ravine located 200 m to the west. The Saskatchewan River valley is located 3 km to the southeast. This sandy upland is vegetated by an open jack pine forest (Photo 15).

FhNe 31 was first identified by Golder under Permit No. 05-038 (Golder 2006a) while conducting HRIA in the project area on behalf of the De Beers Canada Inc. (De Beers) diamond exploration project. A lithic scatter was observed on the surface and eight shovel tests were subsequently excavated. Three were positive for cultural materials including 107 quartz and SRC debitage.

Given that limited testing produced a large number of artifacts, FhNe 31 was subject to Phase I mitigation, and a total of 6 m^2 were excavated. Four units were placed at 5 m and 3 m intervals along the north-south base line in the site area. The sixth unit was placed 5 m east of the central unit. A total of 154 artifacts were recovered from these excavation units, or an average of 25.6 artifacts per 1 m^2. None of the units were expanded given the light artifact density. The artifact assemblage consists exclusively of lithic materials (Table 6).

Lithic material is dominated by SRC, which makes up approximately 97% (n=148) of the assemblage. Quartz (n=3), a single piece of chalcedony, one piece of Gronlid siltstone, and one fragment of granite were also present.

Photo 15: View of FhNe 31

Table 6: Summary of Lithic Materials from FhNe 31

Material Type	Early: Reduction Flake	Middle: Shaping Flake	Middle: Thinning Flake	Late: Finishing Flake	Bifacial Reduction	Flake Fragment	Shatter	End/Side Scraper	Fire-cracked Rock	Total
Chalcedony			1							1
Gronlid Siltstone				1						1
Granite									1	1
Quartz	1	1					1			3
Swan River Chert	19	17	28	14	3	41	25	1		148
Total	**20**	**18**	**29**	**15**	**3**	**41**	**26**	**1**	**1**	**154**

The lithic assemblage was comprised primarily of debitage including flakes (n=85), shatter (n=26), and unclassifiable flake fragments (n=41). The flakes represent all stages of lithic reduction including early reduction (n=20), middle shaping (n=18), middle thinning (n=29), late finishing (n=15), and late bifacial reduction (n=3). There was no significant difference in the ratio of flake types, which suggests that all stages of reduction were taking place at FhNe 31. One tool was recovered from FhNe 31. This consisted of an end/side scraper made from SRC (Photo 16).

Photo 16: End/Side scraper from FhNe 31

The presence of debitage and associated lithic tools suggests that FhNe 31 was utilized as a short term, lithic reduction area. However, given the light artifact density and absence of diagnostic tools, features, or identifiable bone, no further mitigation is recommended at this site.

3.1.6 FhNe 34

FhNe 34 is located in a low-lying area characterized by a thick aspen forest. The site is approximately 800 m north of the 101 Ravine and 2.75 km northwest of the Saskatchewan River. The site is partially disturbed by a bladed trail.

FhNe 34 was first identified by Golder under Permit No. 05-038 (Golder 2006a) during landscape surveys along the 101 Ravine. A light lithic scatter, which included a Late Side-notched projectile point, was observed along a 60 m portion of a bladed trail. Nine shovel probes were excavated within and adjacent to the trail. Only one probe in the trail was positive, producing 12 debitage of SRC and generic chert. Given the potential for an intact component, the site was revisited for additional testing that same year in advance of trail improvements. An additional three shovel probes were excavated in 10 cm levels adjacent to the road. One probe was positive producing two SRC shatter.

The detailed testing program was followed by monitoring of road blading; however, no additional artifacts or features were identified in the ROW. Although FhNe 34 consisted of a light artifact density in a largely disturbed context, it was considered to have moderate interpretive value because of the diagnostic projectile point and the potential for additional intact deposits. A recommendation was made for further assessment if future projects were to impact the site.

During Phase I mitigation of FhNe 34, an attempt was made to relocate the original positive shovel probe using the site sketch map from the SARR form and the UTM coordinates of known positive probes. Overgrowth in the thick aspen forest made the identification of previous shovel probes difficult. In addition, the south side of the trail exhibited more disturbance than the north as a result of Cat push and overburden deposits from previous trail improvements. A decision was made to place a line of probes on the north side of the trail where debitage was previously observed on the surface, and immediately adjacent to the 2005 artifact scatter and positive shovel probe located on the trail. This would determine if any significant intact deposits were present.

A site datum was established and an east-west baseline set up. Five 1 m^2 units were placed along the baseline at 5 m intervals (Photos 17 and 18). Three of the units produced a total of 11 debitage, and one was sterile. The remaining unit, 199N 189E, produced slightly more material with 30 debitage recovered. A sixth unit was opened immediately adjacent to this to create a 1 m by 2 m block. The 199N 190E unit produced an additional 29 artifacts.

Excavation at FhNe 34 ceased at 6 m^2, as overall artifact density was light, and a dense activity area was not identified. A total of 70 artifacts were recovered, or an average of 11 artifacts per 1 m^2. Artifacts appear to be thinly distributed through Levels 1 to 3 (0 cm to 30 cm); however, rodent and tree root disturbance was observed in most units extending to 40 cm DBS, which may account for this distribution. Debitage dominates and comprises almost the entire artifact assemblage, with one tool also recovered (Table 7).

Debitage includes flakes (n=11), unclassifiable flake fragments (n=39), shatter (n=18), and a core fragment. The flakes represent early to middle lithic reduction including early (n=8), middle shaping (n=2), and middle thinning (n=1) flakes. Late finishing flakes were absent from the assemblage, as well, only three middle stage flakes were recovered. The presence of a core, shatter, and early reduction flakes suggests that this site was an early reduction locality. All lithic material found at the site was locally available, with SRC comprising approximately 83% of the assemblage. Quartzite (n=11) and one piece of Gronlid siltstone were also collected from this site.

The lone tool recovered from FhNe 34 consists of a scraper made from SRC (Photo 19). Metric attributes are presented in Appendix C. The scraper is a fragment of an end/side scraper that is unifacially retouched along the distal and right lateral edge. A flake scar exhibiting a step fracture is evident on the dorsal surface.

Phase I mitigation did not identify a significant intact cultural component at FhNe 34. Despite the presence of a formed tool, artifact density was light, and no additional artifact classes were present such as FCR or bone to indicate the potential presence of a feature. Given the light artifact density and previous disturbance to the site, the potential for interpretation at FhNe 34 is considered limited. No further mitigation is recommended.

3.1.7 FhNe 36

FhNe 36 is located on a ridge and terrace feature overlooking the 101 Ravine, which lies approximately 200 m to the west. The Saskatchewan River valley is located approximately 3 km southeast. The surrounding hummocky landscape is vegetated by aspen and willow in low-lying areas, while jack pine is found on elevated ridges. The site is located in an undisturbed area on the east side of the ravine where there are no existing vehicular trails.

FhNe 36 was first identified by Golder under Permit No. 05-038 (Golder 2006a) as part of surveys along the 101 Ravine. An artifact scatter consisting of 30 debitage was observed over a 130 m by 90 m area. Nineteen shovel probes were excavated along the various landforms within the area of the scatter. A cluster of three shovel probes at the base of the ridge were positive producing a total of 23 artifacts; a fourth probe was positive on a jack pine ridge located 50 m to the southwest producing one debitage; and a fifth positive probe located 80 m further south was positive producing 45 debitage. The five positive probes produced a total of 69 SRC, quartz, Red River Chert, and silicified sandstone debitage. The site was considered to have high interpretive value based on the presence of intact cultural deposits, and the variety of lithic materials present. A recommendation was made for further assessment if future projects were to impact the site.

Photo 17: View of FhNe 34

Photo 18: View of excavations at FhNe 34

Table 7: Summary of Lithics from FhNe 34

Material Type	Early: Reduction Flake	Early: Core	Middle: Shaping Flake	Middle: Thinning Flake	Flake Fragment	Shatter	End Scraper	Total
Gronlid Silstone	1	-	-	-	-	-	-	1
Quartzite	2	-	-	-	9	-	-	11
Swan River Chert	5	1	2	1	30	18	1	58
Total	**8**	**1**	**2**	**1**	**39**	**18**	**1**	**70**

Photo 19: End scraper recovered from FhNe 34

During Phase I mitigation of FhNe 36 (Golder 2010c), an attempt was made to relocate the original positive shovel probes using the site sketch map from the SARR form and the UTM coordinates of known positive probes. Two areas of interest included the cluster of three positive probes at the base of the ridge (Area A) and the positive shovel probe at the south end of the site that produced 45 debitage (Area B).

In Area A, two of the 2005 positive probes were relocated. A datum was established and a north-south baseline was set up to intersect these probes. Three 1 m^2 units were initially placed across the landform where Area A was located. The southern and northernmost units produced limited amounts of debitage (11 and 23 respectively); however, the central unit produced not only more debitage (n=53), but also two calcined bone fragments. This area was expanded to a 2 m by 2 m block (Photos 20 and 21)

Photo 20: View of FhNe 36 Area A

Photo 21: Excavation block at FhNe 36 Area A

As part of Phase I mitigation in Area A, 6 m^2 were excavated. A total of 349 artifacts were recovered, or an average of 58 artifacts per 1 m^2. Artifacts came from Levels 1 to 3, although rodent and root disturbance was observed throughout the upper 30 cm. The majority of artifacts (44%) came from Level 2 suggesting the occupation horizon occurred between 10 cm to 20 cm DBS. Lithic materials dominate and account for 99% of the entire artifact assemblage (Table 8). Two unidentifiable calcined bone fragments were also recovered.

Table 8: Summary of Artifacts from FhNe 36 Area A

Material Type	Early: Reduction Flake	Middle: Shaping Flake	Middle: Thinning Flake	Late: Finishing Flake	Flake Fragment	Shatter	Calcined Bone Fragments	Total
Bone	-	-	-	-	-	-	2	2
Basalt	1	-	-	-	-	-	-	1
Quartz	-	-	-	-	1	-	-	1
Swan River Chert	33	7	2	3	210	90	-	345
Total	**34**	**7**	**2**	**3**	**211**	**90**	**2**	**349**

The debitage consisted of flakes (n=46), unclassifiable flake fragments (n=211), and shatter (n=90). The flakes represent all stages of lithic reduction including early (n=34), middle shaping (n=7), middle thinning (n=2), and late finishing flakes (n=2). The small number of late finishing flakes and middle stage reduction flakes compared to the amount of early reduction flakes and shatter suggests that this site was an early reduction locality. All lithic material found at the site is locally available, with SRC comprising approximately 99% of the assemblage. One piece of quartz and basalt were also found at this site.

The two unidentifiable calcined bone fragments were recovered from the eastern quads in 208N 196E. One fragment was present immediately under the organic horizon and the second was noted in a rodent disturbance 0 cm to 20 cm below surface. Although such remains can be associated with a hearth feature, no FCR or soil staining/oxidization was observed in the surrounding units to indicate such a feature was present.

In Area B, a second datum and baseline was established. A 1 m by 2 m block was placed at the location of the 2005 positive probe that produced 45 debitage (Photo 22). However, only one SRC flake was recovered from this location and it was decided to cease excavations. It appears the activity area in Area B was very discrete and captured by the original shovel probe.

A total of 8 m^2 were excavated at FhNe 36 in Area A and Area B as part of Phase I mitigation. Although a light activity area was encountered in Area A, it appears to have been captured by the 2 m^2 excavation block. The presence of debitage suggests that Area A was utilized as a short term, lithic reduction area. Although two calcined bone fragments were present, no associated hearth or boiling pit feature was identified. The overall artifact density of this site when compared with other sites in the project area where Phase II mitigation was recommended is light, and no diagnostic tools, features or identifiable bone were recovered, which limits further interpretations. As a result, no further work is recommended.

Photo 22: View of FhNe 36 Area B

3.1.8 FhNe 45

FhNe 45 is located on a sandy terrace on the eastern bank of the 101 Ravine (Photo 23). The Saskatchewan River valley is located 3.5 km to the southeast. The vegetation consists primarily of an open stand of jack pine.

The site was originally located by Golder under Permit No. 05-038 (Golder 2006a) where one piece of SRC debitage was observed on the surface. Eleven shovel tests were subsequently excavated, with three tests producing 11 SRC debitage.

Given that several shovel probes identified a buried archaeological component represented by lithic artifacts, FhNe 45 was subject to Phase I mitigation. A total of 6 m^2 were excavated. Three 1 m by 2 m blocks were excavated in the site area producing fifteen artifacts, or an average of 2.5 artifacts per 1 m^2. The sparse artifact assemblage consists exclusively of lithic materials, including 14 debitage and one FCR (Table 9).

Photo 23: View of FhNe 45

Table 9: Summary of Lithic Materials from FhNe 45

Material Type	Middle: Shaping Flake	Middle: Thinning Flake	Flake Fragment	Shatter	Core Fragment	End/Side Scraper	Fire-cracked Rock	Total
Siltstone							1	1
Swan River Chert	1	1	8	2	1	1		14
Total	**1**	**1**	**8**	**2**	**1**	**1**	**1**	**15**

SRC makes up 93% (n=14) of the lithic material in the assemblage, while a single piece of siltstone interpreted as FCR was also collected. The assemblage was comprised primarily of debitage including flakes (n=2), shatter (n=2), and unclassifiable flake fragments (n=8). The two identifiable flakes include one middle shaping and one middle thinning flake. One amorphous core fragment was also recovered. Despite the low number of artifacts, a single tool was collected from FhNe 45. This consisted of a SRC end/side scraper (Photo 24).

Given the light artifact density and absence of diagnostic tools, features, or identifiable bone, no further mitigation is recommended at this site.

3.1.9 FhNe 46

FhNe 46 is located on the east bank of the 101 Ravine overlooking the creek to the west. The Saskatchewan River is located 3.5 km to the southeast. The area is characterized by level to rolling terrain surrounded by low stabilized sand dunes and a ravine to the east. The area is vegetated by a poplar forest (Photo 25).

Photo 24: End/Side scraper from FhNe 45

Photo 25: View of FhNe 46

FhNe 46 was first located by Golder under Permit No. 05-038 (Golder 2006a). A single SRC flake was observed on the surface, and eight subsequent shovel probes were excavated. Three tests were positive for cultural materials producing 27 SRC and chert debitage as well as one SRC end scraper.

Beyond producing a formed tool and debitage from a limited variety of lithic materials, FhNe 46 is approximately 125 m southeast of FhNe 45 and 100 m east of FhNe 44. It appears that this portion of the valley was attractive to Precontact populations. As a result, the site was subject to Phase I mitigation. A total of six test units were excavated in a 10 m by 18 m area. All were sterile for cultural materials. Given the paucity of artifacts, no further mitigation is recommended at this site.

3.1.10 FhNe 49

FhNe 49 is located on a jack pine ridge on the east valley crest of the East Ravine (Photo 26). The Saskatchewan River valley is located 2 km to the southeast. FhNe 49 was first identified by Golder (2006a) as a lithic scatter along a bladed trail and turn around area under Permit No. 05-038. Eleven shovel tests were excavated in intact areas along the ridge and one produced 30 pieces of debitage. In 2006, FhNe 104 (a lithic scatter) was recorded in the same area by Western Heritage under Permit No. 06-104. It was determined that FhNe 49 and 104 represent the same site.

Photo 26: View of FhNe 49

Given the extensive scatter along the trail, and the one productive shovel test in adjacent intact areas, FhNe 49 was subject to Phase I mitigation. Four 1 m^2 units were placed in 10 m intervals along a north-south line on the intact ridge where the positive shovel test was located. The most productive unit was expanded to a 7 m^2 excavation block.

A total of 10 m^2 were excavated and 1,196 artifacts were recovered, or an average of 119.6 artifacts per 1 m^2. Lithic materials, including FCR dominate and account for 95% of the entire artifact assemblage (Table 10). Bone fragments (n=63) account for the remainder of the assemblage.

Table 10: Summary of Lithic Materials from FhNe 49

Material Type	Early: Reduction Flake	Middle: Shaping Flake	Middle: Thinning Flake	Late: Finishing Flake	Flake Fragment	Shatter	Core Fragment	Projectile Point	Fire-cracked Rock	Total
Granite									2	2
Knife River Flint					1					1
Quartz				2		4				6
Swan River Chert	37	42	48	4	525	462	2	1		1,121
Total	**37**	**42**	**48**	**6**	**526**	**466**	**2**	**1**	**2**	**1,130**

The majority of lithic materials represented at FhNe 49 are all locally available. SRC comprises approximately 99% of the lithic assemblage, with minor amounts of quartz (n=6) present. Non-local material consisted of one flake of Knife River Flint. Knife River Flint has a bedrock source in west-central North Dakota (Ahler 1986). Although only a single piece was found at FhNe 49, it represents a lithic material that was either acquired through trade or travel where it was transported to the site from great distances.

Debitage dominated the artifact assemblage and included flakes (n=133), shatter (n=466), and unclassifiable flake fragments (n=526). The four stages of lithic reduction were represented including early reduction (n=37), middle shaping (n=42), middle thinning (n=48), and late finishing flakes (n=6). There was no significant difference between the early-middle reduction stages, while a relatively low number of flakes represent the late reduction stage.

One tool was recovered during excavations. This consisted of a SRC projectile point base (Photo 27). It appears to be a small side-notched point; however, it was too fragmented to confidently assign to a cultural affiliation.

Photo 27: Projectile point base from FhNe 49

Two pieces of granite FCR were identified at FhNe 49. FCR is typically associated with hearths or related to some type of cooking activity. Aside from the two pieces of FCR, 63 fragments of bone were also collected. The majority (n=52) consisted of unburned enamel fragments from a large ungulate, while the remainder (n=11) were

small, unidentifiable burned fragments. Despite the presence of FCR and bone fragments, no hearth feature was identified.

The amount of debitage found at FhNe 49 suggests that this site was utilized as an early and middle lithic reduction locality. However, given the generally light artifact density and absence of diagnostic tools, features, or identifiable bone, no further mitigation is recommended at this site.

3.1.11 FhNe 74

FhNe 74 is located in a clearing surrounded by a thick regenerating aspen forest on the east valley crest of the 101 Ravine (Photo 28). The Saskatchewan River is located 3.5 km southeast. The site was first located by Golder (2006a) under Permit No. 05-038 during landscape assessments. A single Red River Chert flake was identified in the small clearing. Eight shovel tests were excavated in the area, with two producing 125 lithic artifacts including SRC, silicified sandstone, chert, and siltstone debitage.

Photo 28: View of FhNe 74

Given the dense artifact recovery from two shovel tests, FhNe 74 was subject to Phase I mitigation. Five 1 m² units were placed at 3 m intervals along an east-west line in the site area. A 7 m^2 block was subsequently opened up connecting the two westernmost productive units. A total of 10 m² were excavated and 3,204 artifacts were recovered, or an average of 320.4 artifacts per 1 m². Lithic materials dominate and account for approximately 99.5% of the entire artifact assemblage (Table 11). Fifteen fragments of FCR and one faunal remain were also present.

SRC makes up 94% (n=2998) of the lithic assemblage followed by quartz 4% (n=129). Aside from these materials a variety of lithic materials were identified at the site including chalcedony, generic chert, quartz sandstone, sandstone, mudstone, and an indeterminate igneous material.

Table 11: Summary of Lithic Materials from FhNe 74

Material Type	Early: Reduction Flake	Middle: Shaping Flake	Middle: Thinning Flake	Late: Finishing Flake	Bifacial Reduction	Flake Fragment	Shatter	Core Fragment	Biface	MURL	Hammerstone	Fire-cracked Rock	Projectile Point Preform	Total
Chalcedony		1	3			3	4							11
Generic Chert	5	3	4	2		14	10							38
Quartz	9	17	7	7		59	30							129
Quartzite		2				6	1							9
Quartz Sandstone	1						1							2
Swan River Chert	348	369	247	358	14	883	761	10	6	1			1	2,998
Sandstone	1											15		16
Mudstone							1							1
Indeterminate Igneous											1			1
Total	**364**	**392**	**260**	**367**	**14**	**965**	**808**	**10**	**6**	**1**	**1**	**15**	**1**	**3,204**

The lithic assemblage was comprised primarily of debitage including flakes (n=1397), shatter (n=808) and unclassifiable flake fragments (n=965). The four stages of lithic reduction were represented by early reduction (n=364), middle shaping (n=392), middle thinning (n=260), late finishing (n=367) and late bifacial reduction flakes (n=14). There was no significant difference between the reduction stages, which suggests that various methods of lithic reduction were taking place at FhNe 74.

A number of tools were recovered from FhNe 74 including one projectile point preform and five crude bifaces (Photo 29). Other tools included one biface fragment, one marginally utilized retouched lithic (MURL) and one hammerstone (Photo 30).

FhNe 74 produced 15 pieces of FCR, which were associated with a dense concentration of lithic materials in a portion of a small excavation block (214N 194-195E and 215N 194-195E). Aside from the FCR, only one unidentifiable burnt calcined fragment was recovered.

The presence of debitage and associated tools suggest that FhNe 74 was utilized as a short term, lithic reduction area. Unfortunately, no diagnostic tools, features or identifiable bone were found at this site, which limits further interpretations. As a result, no further mitigation is recommended at this site.

Photo 29: Tools from FhNe 74
From left to right: Projectile Point Preform (Cat. #1030), Biface (Cat. #287), Biface (Cat. #341), Biface (Cat. #1254), Biface (Cat. #1255), Biface (Cat. #1470)

Photo 30: Hammerstone from FhNe 74 (Cat. #612)

3.1.12 FhNe 77

FhNe 77 is located on a terrace on the west bank of the 101 Ravine (Photo 31). The Saskatchewan River is located approximately 3.5 km to the southeast. An open jack pine forest characterizes the terrace, while the areas located to the north and south are predominantly aspen.

FhNe 77 was first recorded by Golder (2006a) under Permit No. 05-038 during a HRIA for the De Beers diamond exploration project. One SRC flake was observed on the surface. Five shovel tests were subsequently excavated on this landform, with two producing eight SRC debitage.

With potential for a buried archaeological component, FhNe 77 was subject to Phase I mitigation. The positive shovel tests were relocated and three 1 m by 2 m blocks were excavated in a 10 m^2 area oriented along an east-west axis across the site. A total of 6 m^2 were excavated and 131 artifacts were recovered, or an average of 4.2 artifacts per 1 m^2. Lithic materials dominate and account for 93% of the entire artifact assemblage (Table 12). Three fragments of FCR and six bone fragments were also present.

Photo 31: View of FhNe 77

Table 12: Summary of Lithic Materials from FhNe 77

Material Type	Early: Reduction Flake	Middle: Shaping Flake	Middle: Thinning Flake	Late: Finishing Flake	Bifacial Reduction	Flake Fragment	Shatter	Core Fragment	Fire-cracked Rock	Total
Chalcedony				2		1				3
Quartz				1			2			3
Swan River Chert	7	4	15	11	1	47	28	2		115
Indeterminate						1			3	4
Total	**7**	**4**	**15**	**14**	**1**	**49**	**30**	**2**	**3**	**125**

SRC makes up 92% (n=115) of the lithic assemblage, while quartz and chalcedony debitage were present in minor amounts representing 4% of the remainder of the lithic assemblage. The material of one flake fragment and three FCR could not be positively identified.

The lithic assemblage was comprised primarily of debitage including flakes (n=41), shatter (n=30), and unclassifiable flake fragments (n=49). The four stages of lithic reduction were represented by early reduction (n=7), middle shaping (n=4), middle thinning (n=15), late finishing (n=14), and late bifacial reduction flakes (n=1).

Additional artifacts included faunal remains consisting of six unidentifiable large ungulate teeth fragments. No burnt or calcined bones were recovered to suggest a hearth feature was nearby.

The sparse artifact recovery suggests that FhNe 77 was a short term activity area. The slightly higher number of late finishing flakes may indicate that more tool rejuvenation or finishing occurred here. However, a large amount of shatter is also present, which is typically associated with earlier stages of reduction. Unfortunately, no diagnostic tools were located at this site to indicate potential age or cultural affiliation. Given the light artifact density and absence of diagnostic tools, features, or identifiable bone, excavation ceased and no further mitigation is recommended at this site.

3.1.13 FhNe 87

FhNe 87 is located approximately 400 m west of the East Ravine on the south side of a narrow landform extending into the ravine valley (Photo 32). The Saskatchewan River valley lies 1.5 km to the southeast. The vegetation consists of rejuvenated jack pine forest. The site is partially disturbed by the East Ravine Road and a drill pad.

Photo 32: View of FhNe 87

FhNe 87 was originally recorded by Western Heritage (2005) under Permit No. 05-87 and was relocated by Golder (2007e) under Permit No. 07-292. During the original assessment a lithic scatter that included a projectile point tentatively identified as a Pelican Lake was observed in the bladed windrows along the East Ravine Road; however, no subsurface testing was conducted at this time. During the 2007 assessment a lithic scatter consisting of an end scraper, 12 debitage, and two FCR was observed along the road and adjacent to an existing drill pad. Shovel probes placed adjacent to the road were negative for artifacts.

FhNe 87 was selected for Phase I mitigation because two tools including a potential diagnostic point were found within the lithic scatter, and there was still potential for intact components in adjacent areas. Upon returning to the site however, it was apparent that only a narrow strip of land south of the drill pad was still intact before the

landform descended into the East Ravine. Four 1 m^2 units placed at 10 m intervals were excavated in this area. All were sterile for cultural materials and further excavation was ceased. It appears this site has been completely disturbed by previous drilling activities, and no further excavation at this site is recommended.

3.1.14 FhNe 90

FhNe 90 is located in open level terrain along the eastern crest of the East Ravine (Photo 33). Vegetation consists of surrounding stands of mature jack pine with thick aspen and brush on the slopes of the ravine. The Saskatchewan River is located 1 km south of the site. The majority of the site had been previously disturbed by drill pad construction.

Photo 33: View of FhNe 90

FhNe 90 was first identified as an artifact find by Western Heritage under Permit No. 05-087 during an HRIA for Shore Gold's drilling program (Western Heritage 2005). A subsequent testing program of the site was carried out under Permit No. 06-103 after construction of the drill pad revealed a significant artifact scatter (Western Heritage 2006). This resulted in the recovery of a number of artifacts primarily from a disturbed context, including debitage (n=521), two bifaces, a scraper, hammerstone, and one re-worked Hanna projectile point collected from the surface (Western Heritage 2006).

Given the amount of debitage and tools, as well as the presence of a diagnostic projectile point, FhNe 90 was selected for Phase I mitigation to determine if there were any remaining undisturbed areas of the site. Upon arriving to the site, however, it was apparent that most of the area was extensively disturbed. The exception was a small intact stand of jack pine situated at the eastern boundary of the drill pad. This area was the focus of mitigation. A datum was established within this stand of jack pine and five 1 m² units were placed along a

north-south line at 5 m intervals. An additional 1 m by 2 m unit was placed on the northern edge of the intact jack pine adjacent to an artifact scatter observed in the disturbed drill pad.

A total of 7 m^2 were excavated, producing 227 artifacts or an average of 34.3 artifacts per 1 m^2. Lithic materials dominate and account for 94% of the entire artifact assemblage (Table 13). Thirteen fragments of FCR were also present.

Table 13: Summary of Lithic Materials from FhNe 90

Material Type	Early: Reduction Flake	Middle: Shaping Flake	Middle: Thinning Flake	Late: Finishing Flake	Flake Fragment	Shatter	End Scraper	Bifacial Preform	Fire-cracked Rock	Total
Granite									13	13
Quartzite						1				1
Swan River Chert	6	17	8	1	86	93	1	1		213
Total	**6**	**17**	**8**	**1**	**86**	**94**	**1**	**1**	**13**	**227**

The lithic materials represented at FhNe 90 are all locally available. SRC makes up 94% (n=213) of the assemblage, while one piece of quartzite and 13 fragments of granite were also present.

Debitage comprises the majority of the assemblage including flakes (n=32), shatter (n=94), and unclassifiable flake fragments (n=86). Unfortunately the highly fragmented assemblage only allowed 32 flakes to be identified. The four stages of lithic reduction were represented in minor amounts by early reduction (n=6), middle shaping (n=17), middle thinning (n=8), and late finishing flakes (n=1).

FhNe 90 produced two formed tools including one SRC end scraper and one SRC biface preform (Photo 34).

Photo 34: Tools from FhNe 90
From left to right: End Scraper (Cat. #230), Biface Preform (Cat. #229)

Although 13 pieces of FCR were identified at FhNe 90, they were scattered throughout the units in no discernable concentration. No presence of a hearth or charcoal concentration that might relate to a centralized fire was observed. In addition, no faunal remains were identified.

Given the sparse artifact density and extensively disturbed nature of the site, excavations at FhNe 90 ceased and Phase II mitigation was not recommended.

3.1.15 FhNe 91

FhNe 91 is located on a terrace along the eastern crest of the East Ravine, approximately 2 km northwest of the Saskatchewan River (Photo 35). Vegetation consists of thick rejuvenated jack pine with surrounding stands of aspen. A portion of the site had been previously disturbed by a 5 m wide trail oriented in a northeast direction through the site.

Photo 35: View of FhNe 91

FhNe 91 was originally identified by Western Heritage in 2005 under Permit No. 05-087 as an artifact scatter along a trail to a drill pad. Subsequent testing and excavation was carried out at the site under Permit No. 06-103 (Western Heritage 2006). A possible hearth feature (soil stain) and lithic reduction area was identified in a 9 m^2 excavation block in the trail. Over 900 debitage were recovered. As a result of the potential feature and artifact density, FhNe 91 was selected for Phase I mitigation.

The original excavation units were relocated along the trail and it was decided to expand on the original block in adjacent intact areas. A north-south oriented grid line was established and a 4 m² block was first placed immediately south of the trail adjacent to the original excavation. Three additional 1 m² units were excavated

north of the trail opposite the excavation block, and, and a 1 m^2 unit and a 50 cm by 50 cm partial unit were placed to the west as exploratory tests.

A total of 8.25 m^2 were excavated; however, artifact recoveries were sparse. A total of 98 artifacts were collected, or an average of 11.8 artifacts per 1 m^2 (Table 14). Lithic materials dominate the artifact recoveries and account for 98% of the entire artifact assemblage. One fragment of FCR and one calcined/burned bone fragment were also present.

Table 14: Summary of Lithic Materials from FhNe 91

Material Type	Early: Reduction Flake	Middle: Shaping Flake	Middle: Thinning Flake	Late: Finishing Flake	Flake Fragment	Shatter	Fire-cracked Rock	Total
Granite							1	1
Gronlid Siltstone					1			1
Quartz					2	1		3
Swan River Chert	1	18	8	1	48	16		92
Total	**1**	**18**	**8**	**1**	**51**	**17**	**1**	**97**

The lithic materials represented at FhNe 91 are all locally available. SRC comprises approximately 95% (n=92) of the lithic assemblage followed by quartz (n=3) and Gronlid siltstone (n=1).

The collection is almost exclusively debitage, consisting of classifiable flakes (n=28), flake fragments (n=51), and shatter (n=17). Classifiable flakes include early reduction (n=1), middle shaping (n=18), middle thinning (n=8), and late finishing flakes (n=1). No tools were recovered from the site.

Although the original excavation block was relocated and expanded upon during this mitigation phase, there were few additional artifacts recovered and no further evidence of a hearth feature. With reference to the latter; however, it should be observed that charcoal staining and oxidization of the sand from forest fires was observed. It appears that previous excavations at this site removed most of this lithic reduction activity area, and Phase II mitigation is not recommended.

3.1.16 FhNe 102

FhNe 102 is located on a narrow point of land along the eastern edge of the East Ravine, which eventually enters the Saskatchewan River approximately 1.1 km to the southeast (Photo 36). While this site has been largely disturbed by a drill pad, intact areas with regenerating jack pine are present.

Photo 36: View of FhNe 102

FhNe 102 was originally located by Western Heritage (2006) under Permit No. 06-103 during a post construction HRIA of a drill pad. A large scatter of lithic debitage was found in a bulldozer push. The site was revisited under Permit No. 07-292 (Golder 2007e) where 13 artifacts were observed on the drill pad including a biface and the midsection of a projectile point. Five shovel tests were subsequently placed adjacent to the scatter; two tests produced eight pieces of debitage. During the 2008 inventory assessment (Golder 2009b), FhNe 102 was revisited again, and a broken SRC biface fragment was collected from the surface of the trail leading into the drill pad. An additional 35 shovel tests were placed in intact areas surrounding the drill pad, resulting in two positive shovel tests that produced debitage. Despite the almost complete disturbance of the narrow point of land where the site was located, there appeared to be intact components still present.

As a result of these positive shovel tests, FhNe 102 was subject to Phase I mitigation. Excavations focused on expanding the positive tests to the west of the drill pad. This resulted in a total of 10 m² of excavation, including a 7 m² block centered on the most productive test. An additional three 1 m^2 units were placed 3 m north of the excavation block and at 2 m and 4 m north east of the excavation block.

FhNe 102 produced a total of 1,374 artifacts, or an average of 137.4 artifacts per 1 m². The majority of the artifacts were found within four units of the main block (208N 198-199E; 209N 198-199E). Additional units proved to be less productive and therefore it appears that the majority of the activity area was captured during excavations. Lithic debitage dominates, accounting for nearly 100% of the assemblage (Table 15). Two bifaces and four fragments of FCR were also collected.

Table 15: Summary of Lithic Materials from FhNe 102

Material Type	Early: Reduction Flake	Middle: Shaping Flake	Middle: Thinning Flake	Late: Finishing Flake	Flake Fragment	Shatter	Core Fragment	Biface	Fire-cracked Rock	Total
Generic Chert		1	2	1	21	13				38
Granite						2			4	6
Gronlid Siltstone	1									1
Mudstone					1					1
Quartz					3	1				4
Swan River Chert	67	52	53	34	610	505	1	2		1,324
Total	**68**	**53**	**55**	**35**	**635**	**521**	**1**	**2**	**4**	**1,374**

All lithic materials found at FhNe 102 are locally available, with SRC comprising approximately 96% of the assemblage. Generic chert, granite, Gronlid siltstone, mudstone, and quartz make up the remainder of the assemblage.

The lithic materials were comprised almost exclusively of debitage, including flakes (n=211), shatter (n=521), and unclassifiable flake fragments (n=635). The flakes represent all stages of lithic reduction including early (n=68), middle shaping (n=53), middle thinning (n=55), and late finishing flakes (n=35). There was no significant difference among the number of flakes representing the various reduction stages, which suggests that all stages of reduction were occurring at FhNe 102. One SRC core fragment and two SRC bifaces were also recovered (Photo 37).

The excavations at FhNe 102 indicate the presence of a short term, lithic reduction area. Unfortunately, no diagnostic tools were located at this site and therefore no cultural affiliation can be made. Four pieces of FCR were also identified at FhNe 102; however, there was no evidence of a hearth feature or any faunal remains to indicate additional activities were occurring. As a result, Phase II mitigation was not recommended.

3.1.17 FhNe 126

FhNe 126 is located on the eastern crest of the East Ravine, approximately 4 km north of the Saskatchewan River (Photo 38). Vegetation ranges from thick regenerating jack pine saplings, to mature jack pine and deadfall. A portion of this site was disturbed by the East Ravine Road; however, intact areas were located.

This site was originally identified by Western Heritage (2006) under Permit No. 06-103, and was subsequently revisited by Golder (2007e and 2009b) under Permits No. 07-292 and No. 08-094. The site consists of a lithic scatter extending along the East Ravine Road for approximately 100 m. Two bifaces were collected during the 2007 revisit (Golder 2007e). A total of nine shovel tests were excavated at this time in intact portions immediately adjacent (east) to the road and all were sterile; however, one positive test was located approximately 80 m further to the east. During a site revisit in 2008 additional testing was conducted in intact areas that indicated there were two, albeit sparse, occupation areas. These are referred to below as FhNe 126 Area A and Area B.

Photo 37: Bifaces from FhNe 102
From left to right: Cat. #1384 and Cat. #286

Photo 38: View of FhNe 126 Area A

Area A is located at the south end of the previously recorded scatter and approximately 20 m east of the road where one positive test produced a quartz end scraper, and three SRC debitage in an area of thick regenerating jack pine. Area B is located approximately 80 m east of Area A in a mature stand of jack pine where three positive tests produced limited amounts of debitage.

Based on the extensive artifact scatter found on the East Ravine Road, and evidence for potential intact components, Phase I mitigation was considered warranted. A total of 8 m² were excavated, with Area A and Area B each receiving 4 m². Each area is discussed separately below.

A 2 m by 2 m excavation block was placed at Area A, expanding around the positive shovel test that produced the end scraper. Only 47 artifacts were recovered here, or an average of 11.75 artifacts per 1 m². Lithic materials make up the entire artifact assemblage and were comprised of locally available material. Once again, SRC is the most common accounting for approximately 77% (n=41) of the lithic assemblage, followed by quartz (n=11) and mudstone (n=1) (Table 16).

Table 16: Summary of Lithic Materials from FhNe 126 Area A

Material Type	Early: Reduction Flake	Middle: Shaping Flake	Flake Fragment	Shatter	End Scraper	Biface	Uniface Preform	Projectile Point Preform	Total
Mudstone			1						1
Quartz			4	2	1			1	8
Swan River Chert	3	1	18	13		1	1	1	38
Total	**3**	**1**	**23**	**15**	**1**	**1**	**1**	**2**	**47**

Debitage is the most common artifact class and includes flakes (n=4), shatter (n=15) and unclassifiable flake fragments (n=23). The few identifiable flakes represent early (n=3) and middle shaping (n=1) reduction stages.

Despite the low frequency of debitage, a number of tools were recovered from this site. In addition to the end scraper and biface that were collected during the inventory assessment under Permit No. 08-094 (Golder 2009b), another biface preform was found on the East Ravine Road, and a uniface and projectile point preform were recovered from the excavation (Photo 39).

At Area B, two 1 m by 2 m blocks were placed adjacent to positive shovel tests located approximately 10 m apart. A total of 96 artifacts were recovered, or an average of 24 artifacts per 1 m². This consisted of lithic materials dominated by SRC (n=91), with minor amounts of quartz (n=4) and mudstone (n=1) (Table 17).

Debitage included flakes (n=9), flake fragments (n=51), and shatter (n=36). All stages of lithic reduction were represented by early reduction (n=2), middle shaping (n=3), middle thinning (n=2), and late finishing (n=2) flakes. No tools or faunal material were recovered.

Although Area B produced slightly more artifacts than Area A, cultural materials were generally sparse, with no diagnostic tools or faunal remains. In comparison to other sites in the study area, the artifact recoveries from both areas of FhNe 126 were sparse with only one artifact class represented. As a result, no further mitigation was recommended.

Photo 39: Tools from FhNe 126 Area A
From left to right: Projectile Point Preform (Cat. #136), Uniface Preform (Cat. #129), Biface (Cat. #10), End Scraper (Cat. #9)

Table 17: Summary of Lithic Materials for FhNe 126 Area B

Material Type	Early: Reduction Flake	Middle: Shaping Flake	Middle: Thinning Flake	Late: Finishing Flake	Flake Fragment	Shatter	Total
Mudstone					1		1
Quartz					3	1	4
Swan River Chert	2	3	2	2	47	35	91
Total	**2**	**3**	**2**	**2**	**51**	**36**	**96**

3.1.18 FhNe 135

FhNe 135 was originally recorded by Golder archaeologists under Permit No. 08-094 (Golder 2009b) during assessment of the Star Open Pit area (Photo 40). It was an artifact scatter located on the west valley crest of the West Ravine, approximately 1.3 km north of the Saskatchewan River. The site is located approximately 100 m southeast of a reclaimed drill pad on a narrow ridge with a slight northwest-southeast orientation. Vegetation on the ridge consists of an open grassy area with burnt deadfall and regenerating jack pine and aspen. The surrounding upland consists of a mix of aspen and jack pine, while the low area below the ridge within the West Ravine is comprised of dense aspen and an understory of brush.

Photo 40: View of FhNe 135

During the original assessment, 13 shovel probes were placed in a 60 m by 15 m area along the ridge. Seven shovel tests spaced at 5 m intervals along the length of the ridge were positive for cultural materials. Fifty-four pieces of debitage representing all stages of lithic reduction were recovered from these tests.

FhNe 135 was subsequently subject to Phase I mitigation, where a total of 8 m^2 were excavated. A 2 m by 2 m excavation block was opened adjacent to the westernmost productive shovel tests (218-219N 190-191E), and an additional two 1 m by 2 m blocks were opened further east along the landform adjacent to other productive tests (214N 197-198E; 211N 205-206E). A total of 3,296 artifacts were recovered, or an average of 412 artifacts per 1 m^2. Lithic materials dominate the artifact assemblage and account for 99% of the entire artifact assemblage (Table 18). Eleven fragments of FCR and one bone fragment were also present.

The vast majority of lithic materials represented at FhNe 135 are all locally available. SRC comprises approximately 96% (n=3170) of the lithic assemblage, followed by generic chert (n=43) and Gronlid siltstone (n=36). A variety of other materials were present in lesser numbers including chalcedony (n=16), mudstone (n=10), quartz (n=6), and quartzite (n=6). Exotic material is represented by two fragments of Knife River Flint.

The lithic assemblage was comprised primarily of debitage including flakes (n=1,378), shatter (n=999), and unclassifiable flake fragments (n=901). The flakes represent all stages of lithic reduction including early (n=287), middle shaping (n=282), middle thinning (n=267), and late finishing flakes (n=530).

Table 18: Summary of Lithic Materials from FhNe 135

Material Type	Early: Reduction Flake	Middle: Shaping Flake	Middle: Thinning Flake	Late: Finishing Flake	Retouch Flake	Bifacial Reduction	Flake Fragment	Shatter	Core	Fire-cracked Rock	Total
Chalcedony		3	2	2			5	4			16
Generic Chert	5	4	6	1			13	14			43
Granite										2	2
Gronlid Siltstone	11			1			7	17			36
Indeterminate Igneous	1										1
Knife River Flint	1						1				2
Mudstone								2		8	10
Quartz							1	5			6
Quartzite	1						3	2			6
Sandstone										1	1
Siltstone							1				1
Swan River Chert	268	275	258	526	2	12	870	955	4		3,170
Indeterminate			1								1
Total	**287**	**282**	**267**	**530**	**2**	**12**	**901**	**999**	**4**	**11**	**3,295**

A total of 11 pieces of FCR were identified at FhNe 135. This included material such as granite (n=2), indeterminate igneous rock (n=8), and sandstone (n=1). Although FCR is typically associated with hearths or related to some type of cooking activity, no defined feature was identified, and only one calcined/burned bone fragment was recovered.

The high density of debitage from FhNe 135 suggests the site was an intensively used, yet discrete lithic reduction locality. Although shatter and unclassifiable debitage make up the majority of the lithic materials, the high number of late finishing flakes indicates that later stages of reduction or tool finishing were occurring here. Unfortunately, no tools were recovered from the site, which limits the ability to interpret such things as site age or cultural affiliation. The activity area, dominated by debitage, was captured by the 8 m^2 excavation block and it was anticipated that additional excavation would result in diminishing returns. As a result, no further mitigation is recommended.

3.1.19 FhNe 143

FhNe 143 is located in an old forest fire burn clearing approximately 400 m east of the 101 Ravine (Photo 41). The Saskatchewan River is located approximately 3.5 km southeast of the site. The landscape is characterized by gently undulating to level terrain, with vegetation consisting of intermittent rejuvenating jack pine and a thick aspen forest located to the west of the site adjacent to the ravine.

Photo 41: View of FhNe 143

This site was initially recorded by Golder (2009b) under Permit No. 08-094 during the inventory assessment of the Overburden Storage Area. One SRC debitage was observed in an exposure on the surface. A shovel test was placed adjacent to the find that produced 88 pieces of debitage. An additional eight shovel tests were excavated in the area, which failed to produce additional cultural materials. Although additional testing indicated that the site was not extensive, FhNe 143 appeared to represent a discrete activity area with a dense concentration of debitage. As a result, it was selected for Phase I mitigation.

An excavation block consisting of 8 m² was placed around the productive shovel test. A total of 1,375 artifacts were recovered, or an average of 178.9 artifacts per 1 m². Lithic materials were the only artifacts found at this site and, therefore, represent 100% of the entire artifact assemblage (Table 19).

Table 19: Summary of Lithic Materials from FhNe 143

Material Type	Early: Reduction Flake	Middle: Shaping Flake	Middle: Thinning Flake	Late: Finishing Flake	Late: Bifacial Reduction Flake	Flake Fragment	Shatter	Total
Generic Chert	16	18	25	13		20	18	110
Quartzite							1	1
Swan River Chert	152	163	146	395	1	156	251	1,264
Total	**168**	**181**	**171**	**408**	**1**	**176**	**270**	**1,375**

The lithic materials represented at FhNe 143 are all locally available. SRC comprises approximately 92% (n=1,264) of the lithic assemblage, followed by generic chert (n=110) and quartzite (n=1).

The lithic assemblage was comprised entirely of debitage including flakes (n=909), shatter (n=270), and uncatagorizable flake fragments (n=176). The flakes represent all stages of lithic reduction including early (n=168), middle shaping (n=181), middle thinning (n=171), late finishing (n=408), and a late bifacial reduction flake (n=1).

The high density of debitage from FhNe 143 suggests this site was intensely used as a lithic reduction locality. Although all lithic reduction stages are present at this site, the high number of late finishing flakes indicates that later stages of reduction or tool finishing were occurring here. Despite the high density of artifacts at FhNe 143, only one artifact class is present, and no tools were recovered to indicate cultural affiliation. As a result, further mitigation is not recommended.

3.1.20 FhNe 155

FhNe 155 is located 400 m northwest of the muskeg that feeds the West Ravine and 3 km northwest of the Saskatchewan River (Photo 42). This site is situated on level terrain on the edge of a jack pine upland and was identified as a surface scatter along a bladed trail between Shore Road and the 101 Road.

Photo 42: View of FhNe 155

Golder (2009b) recorded this site under Permit No. 08-094. Over 50 SRC and quartz debitage, along with FCR were observed along the trail. In addition, a SRC end scraper was collected. A total of 22 shovel tests were excavated within the intact portions adjacent to the road. One shovel test on the north side of the trail produced a single SRC flake.

Based on the extensive surface scatter that included a tool and one positive shovel test, FhNe 155 was selected for Phase I mitigation. A total of 4 m² were excavated. A 1 m by 2 m excavation block was opened up adjacent to the lone positive shovel test on the north side of the trail, and a second 2 m by 1 m block was opened further east adjacent to debitage observed in an exposure, also on the north side of the road. Only two artifacts were recovered during excavation (one from each block), or an average of 0.5 artifacts per 1 m² (Table 20). The two artifacts consisted of a thinning flake and a fragment of shatter made from SRC.

Table 20: Summary of Lithic Materials from FhNe 155

Material Type	Middle: Thinning Flake	Shatter	Total
Swan River Chert	1	1	2
Total	**1**	**1**	**2**

Given the previously disturbed nature of the site, the sparse artifact recoveries from the excavation units, and the negative shovel tests from the earlier testing program, excavations ceased, and no further mitigation was recommended at FhNe 155.

3.1.21 FhNf 59

FhNe 59 is located on a terrace, approximately 150 m west of the 101 Ravine. The Saskatchewan River is located approximately 3.5 km south east. The surrounding hummocky landscape consists of an aspen forest in low-lying and ravine areas, and an open jack pine forest in various stages of regeneration in upland areas. The site is located in an undisturbed area on the west side of the ravine where there is no vehicular access (Photo 43).

Photo 43: View of FhNf 59

FhNf 59 was first identified by Golder under Permit No. 05-038 (Golder 2006a) as part of surveys along the 101 Ravine. A lithic scatter consisting of 40 SRC, Red River Chert, black pebble chert, and chalcedony debitage was observed in an approximately 100 m by 50 m area. One SRC end scraper was also collected from a tree throw. Fifteen shovel probes were excavated in the area of the scatter, and three were positive producing nine pieces of debitage. Given the presence of a buried component, variety of lithic material types and recovery of a formed tool, the site was considered to have high interpretive value. A recommendation was made for further assessment if future projects were to impact the site.

During Phase I mitigation of FhNf 59 (Golder 2010b), an attempt was made to relocate the original positive shovel probe off the road using the site sketch map from the SARR form and the UTM coordinates of known positive probes. Although the identification of probes was difficult, a surface scatter was observed in association with several pieces of remnant blue flagging tape from the 2005 survey. A decision was made to establish a north-south baseline through this area. Three 1 m^2 units were placed at 10 m intervals, with one unit (220N 203E) placed in the central area immediately adjacent to surface flakes. This latter unit was the most productive and was subsequently expanded to a block consisting of 8 m^2. The two outlying units were either sterile or produced negligible results.

A full 10 m^2 were excavated at FhNf 59 as part of Phase I mitigation (Photo 44). A total of 561 artifacts were recovered, or an average of 56 artifacts per 1 m^2. Artifacts were observed coming out of the wall between 5 cm and 15 cm DBS and represented an obvious occupation horizon. Excavation proceeded to Level 3 (20 cm to 30 cm DBS), but was sterile for cultural material.

Lithic materials account for the entire artifact assemblage (Table 21). All material found at the site is locally available, with SRC comprising nearly the entire assemblage. The only other material is represented by two pieces of Gronlid siltstone.

Debitage dominates and consists of flakes (n=50), unclassifiable flake fragments (n=315), shatter (n=193), and a core fragment. The flakes represent all stages of lithic reduction including early (n=20), middle shaping (n=20), middle thinning (n=4), and late finishing flakes (n=6). Cortex was visible on the core fragment, which represents early stages of reduction. There was no significant difference in the ratio of flake types, which suggests that all stages of reduction were taking place at FhNe 14.

Two stone tools were also recovered from the site. This consists of a projectile point fragment, and a crude biface fragment, both made from SRC (Photos 45 and 46). Metric attributes are presented in Appendix C. The biface fragment is represented by the proximal end, which exhibits bifacial flake scars along the lateral edges.

The point is represented by the base and a portion of the right notch and shoulder. The basal margin is finely retouched to produce a convex shape. The notches originate from the corner of the base and angle upward, producing a pointed basal edge as well as a corner notch. The point fragment is similar to Pelican Lake points, which date from approximately 3,300 to 1,850 rcybp (Dyck 1983; Walker 1999).

Although an activity area was identified at FhNf 59, this lithic reduction area appears to have been captured by the 8 m^2 excavation block. The remaining excavation units were either negative or produced a minor amount of debitage, suggesting the site was not extensive. The recoveries and distribution pattern is typical of lithic reduction sites found throughout the project area.

Photo 44: Excavation block at FhNf 59

Table 21: Summary of Lithics from FhNf 59

Material Type	Early: Reduction Flake	Early: Core Fragment	Middle: Shaping Flake	Middle: Thinning Flake	Late: Finishing Flake	Flake Fragment	Shatter	Biface Fragment	Projectile Point Base	Total
Gronlid Silstone	-	-	-	-	-	2	-	-	-	2
Swan River Chert	20	1	20	4	6	313	193	1	1	559
Total	**20**	**1**	**20**	**4**	**6**	**315**	**193**	**1**	**1**	**561**

Photo 45: Corner notched projectile point base from FhNf 59

Photo 46: Biface fragment from FhNf 59

The overall artifact density of this site when compared with other sites in the project area where Phase II mitigation was recommended is light, and represented by only one class of artifact (lithics). The presence of a diagnostic tool suggests that this site may have been occupied some 3,000 years ago; however, no features or identifiable bone were found at this site, which limits further interpretations of the site. Given the generally light artifact density and absence of additional artifact classes or features, this site is considered to have limited additional interpretational value. No further work is recommended.

3.2 Phase II Mitigation

At the completion of Phase I excavation, the results were evaluated and the sites rated based on previously determined criteria. This included artifact density, artifact classes represented (i.e., all three classes of lithic, bone, and FCR), evidence for features, site preservation and general uniqueness. This evaluation was submitted to the Heritage Resources Branch as a Technical Memo with recommendations for either the cessation of mitigation or continued Phase II excavation (Golder 2008e). Based on this evaluation process, seven sites were selected for Phase II mitigation (Figure 2). These sites received an additional 10 m^2 of excavation and are discussed below. Artifact density plots for each site can be found in Appendix B.

3.2.1 FhNe 82

FhNe 82 is located immediately east of the 101 Ravine, approximately 4 km northwest of the Saskatchewan River (Photo 47). This site is situated along two interconnected, low ridges. The sandy ridges are fairly open with scattered jack pine and poplar located along them. Thicker poplar forests are located to the east and west.

FhNe 82 was first identified by Golder (2006a) under Permit No. 05-038. Thirty-one SRC debitage and one unidentifiable bone fragment were observed on the surface in two areas (A and B) within a 100 m by 60 m area. Eighteen shovel probes were originally excavated in the immediate vicinity of the flake clusters. Two probes associated with the northern flake cluster (Area B) produced cultural materials, resulting in the recovery of 29 SRC debitage. None of the shovel probes in the southern cluster (Area A), which had a larger artifact scatter, produced artifacts.

Photo 47: View of FhNe 82 Area A

Figure 2: Location of Known Heritage Resources Recommended for Phase II Mitigation in Star-Orion South Diamond Project Area

Given that lithic artifacts were recovered from a buried context, as well as observed over a relatively large area on the surface, FhNe 82 was selected for Phase I and ultimately Phase II mitigation. A total of 20 m² were excavated. The initial phase of mitigation revealed a greater density of intact artifacts in Area A. As a result, a total of 16 m² were excavated here by the end of Phase II mitigation, while only 4 m² were excavated in Area B. These areas are discussed separately below.

The initial units in Area A were placed adjacent to concentrations of surface finds. This consisted of four 1 m^2 units placed over a 50 m by 25 m area. The unit near the central portion of the scatter revealed a dense concentration of artifacts, and was expanded to 3 m. As a result of these findings, this area served as the focus of Phase II mitigation, and an additional 10 m^2 block was excavated (Appendix B). Area A produced a total of 1,896 artifacts or an average of 118.5 artifacts per 1 m² (Table 22). The ratio of artifact classes was comparable, with lithic materials accounting for approximately 38% of the entire assemblage, FCR approximately 27%, and faunal remains approximately 35%.

Table 22: Summary of Lithic Materials from FhNe 82 Area A

Material Type	Early: Reduction Flake	Middle: Shaping Flake	Middle: Thinning Flake	Late: Finishing Flake	Bifacial Reduction	Flake Fragment	Shatter	Core Fragment	End Scraper	Side Scraper	End/Side Scraper	Fire-cracked Rock	Total
Chalcedony						3	1						4
Granite	1		1	2		6	5		1	1			18
Granite												449	449
Indeterminate Igneous												59	59
Knife River Flint		1				1			1				3
Mud-stone												1	1
Quartz	1					4	6	1					12
Quartzite							2						2
Swan River Chert	43	45	36	55	4	252	244	2			1		682
Sand-stone												1	1
Total	**45**	**46**	**37**	**57**	**4**	**266**	**258**	**3**	**2**	**1**	**1**	**510**	**1,231**

The majority of lithic materials present in Area A are locally available with SRC dominating. A minor amount of non-local material is represented by Knife River Flint (n=3). The lithic assemblage was comprised primarily of debitage including flakes (n=189), shatter (n=258) and unclassifiable flake fragments (n=266). The four stages of lithic reduction were represented by early reduction (n=45), middle shaping (n=46), middle thinning (n=37), late finishing (n=57), and late bifacial reduction flakes (n=4). Five tools were recovered including end scrapers (n=2), a side scraper (n=1), an end/side scraper (n=1), and a biface fragment (Photo 48).

Photo 48: Tools from FhNe 82
From left to right: Area B - Pelican Lake Projectile Point (Cat. #31) and Area A - End Scraper (Cat. #69), Biface Fragment (Cat. #621), End/Side Scraper (Cat. #1057), End Scraper (Cat. #1195), Side Scraper (Cat. #1209)

Additional artifacts consisted of FCR (n=510) and faunal remains (n=665). Although the frequency of faunal remains is high, the fragments were very small and had a combined mass of 196.4 g. No faunal remains were identifiable; however, the majority (n=663) were burnt or calcined. One unburnt bone fragment along with a fragment of tooth enamel was also recorded. Despite the presence of FCR and calcined bone fragments, no distinct hearth feature was identified.

The excavation block in Area A revealed a discrete activity area consisting of three artifact classes. The FCR and comminuted bone are suggestive of a nearby hearth feature where the full range of lithic reduction occurred in an effort to produce tools. Unfortunately a distinct hearth feature was not identified, and by the end of Phase II, it was evident the excavation block had captured the entire activity area. Based on previous testing, the site does not appear to be extensive. As a result, no further excavation was recommended at this location

Area B was far less productive than Area A and only produced a total of eight artifacts or on average two artifacts per 1 m² (Table 23; Appendix B). As a result, excavation ceased here after Phase I to focus on Area A. The units were placed adjacent to the original positive shovel tests. Artifacts consisted of debitage (n=4), FCR (n=3), and one Pelican Lake projectile point. This may suggests that Area B and possibly Area A were occupied some 3,000 years ago.

Table 23: Summary of Lithic Materials from FhNe 82 Area B

Material Type	Early: Reduction Flake	Middle: Shaping Flake	Flake Fragment	Projectile Point	Fire-cracked Rock	Total
Granite					3	3
Swan River Chert	2	1	1	1		5
Total	**2**	**1**	**1**	**1**	**3**	**8**

3.2.2 FhNe 98

FhNe 98 was originally identified under Permit No. 05-87 (Western Heritage 2005) as an artifact scatter found on the surface of Drill Pad SPF 002 (Photo 49). The site was revisited and tested under Permit No. 08-094 (Golder 2009b) as part of the inventory assessment. A lithic scatter consisting of 27 SRC debitage was observed in an 80 m by 50 m area within the disturbed pad. Most significantly, an Early Side-notched projectile point was collected from the access road leading south of the drill pad (Golder 2009b).

Photo 49: View of FhNe 98

A total of 32 shovel tests were placed in intact areas surrounding the drill pad in a 1 ha area during the assessment. Two positive shovel tests were excavated off the northeast corner of the drill pad, along the valley crest of the West Ravine. One test produced 57 SRC debitage, and the other test located 10 m to the east produced one piece of shatter. As a result of these positive shovel tests and surface finds, FhNe 98 was subject to Phase I and Phase II mitigation.

Two excavation blocks totalling 20 m^2 were expanded around the positive shovel tests located off the northeast corner of the disturbed drill pad (Appendix B). A total of 3,174 artifacts were recovered, or an average of 151.1 artifacts per 1 m^2. Lithic materials dominate representing 99.5% of the entire assemblage (Table 24). Two fragments of FCR and 13 faunal remains were also present.

Table 24: Summary of Lithic Materials from FhNe 98

Material Type	Early: Reduction Flake	Middle: Shaping Flake	Middle: Thinning Flake	Late: Finishing Flake	Bifacial Reduction	Flake Fragment	Shatter	Nodule	Core Fragment	Retouched Flake	End Scraper	Biface	Hammer Stone	Projectile Point	Fire-cracked Rock	Total
Arkose		2	1	1		11	3									18
Chalcedony		1	1				1									3
Generic Chert	25	25	16	23	4	58	48				2					201
Granite						1									2	3
Gronlid Siltstone	9		1	1		16										27
Knife River Flint	1					1	1									3
Mudstone	1	2				3	3									9
Quartz	7	3	3	3		13	65			1						95
Quartzite	1	1				4							1			7
Sandstone						1	2									3
Silicified Peat			1													1
Siltstone							1									1
Swan River Chert	402	286	180	375	9	852	673	1	7	2	1	1		1		2,790
Total	**446**	**320**	**203**	**403**	**13**	**960**	**797**	**1**	**7**	**3**	**3**	**1**	**1**	**1**	**2**	**3,161**

The majority of lithic materials represented at FhNe 98 are locally available. SRC accounts for approximately 88% (n=2790) of the lithic assemblage. The second most common occurring material is generic chert 6% (n=201) followed by quartz 3% (n=95). The remaining 3% is represented by a variety of lithic materials including Gronlid siltstone (n=27), mudstone (n=9), quartzite (n=7), chalcedony (n=3), sandstone (n=3), granite (n=3), silicified peat (n=1), siltstone (n=1), and arkose (n=1).

A minor amount of non-local material is represented by Knife River Flint (n=3), which has a bedrock source located in west-central North Dakota (Clayton et al. 1970; Fedirchuk and McCullough 1992:76). This exotic material was likely traded for or transported to the site over great distances.

Once again debitage comprised the majority of the assemblage, as represented by flakes (n=1388), shatter (n=797), and flake fragments (n=960). All stages of lithic reduction were represented including early reduction (n=446), middle shaping (n=320), middle thinning (n=203), late finishing flakes (n=403), and bifacial reduction (n=13). Seven SRC core fragments and one SRC nodule were also collected.

Nine tools were recovered during excavations. This included one projectile point, three retouched flakes, three end scrapers, one SRC biface, and one quartzite hammerstone (Photo 50).

Photo 50: Tools from FhNe 98
From left to right: Early Side-notched Projectile Point (Cat. #1718), End Scraper (Cat. #2793), End Scraper (Cat. #381), End Scraper (Cat. #457), Biface (Cat. #1156)

Only two pieces of FCR was identified at FhNe 98. Thirteen faunal remains were also collected. These unidentifiable fragments included 11 calcined/burned fragments and two unburned fragments.

The artifact density at FhNe 98 suggests that this site was intensively used as a lithic reduction locality. Once again, all stages of lithic reduction are represented; indicating tool production was the objective. This is further suggested by the presence of a pecking stone, which suggests use as a hard hammer percussion tool. Although minor amounts of FCR and calcined bone fragments were present, no evidence of a hearth feature was observed.

3.2.3 FhNe 115

FhNe 115 is located on a knoll and side slope of a ridge feature located approximately 600 m west of the East Ravine and 2.5 km northwest of the Saskatchewan River (Photo 51). The site is near the north end of a tributary flowing southeast into the ravine. The hummocky terrain is characterized by a regenerating jack pine forest. Shore Road is located immediately south of the site while a drill pad disturbance occurs to the east.

Photo 51: View of FhNe 115

FhNe 115 was first identified by Golder (2006b) under Permit No. 06-064 during HRIA assessments for De Beers. A McKean lanceolate projectile point was collected from the surface on top of the knoll, while a small but dense debitage concentration was observed along the side slope near the base of the ridge. Included in this concentration were approximately 90 debitage in a 1.5 m area. A few flakes were also observed on the adjacent disturbed drill pad. Subsequent testing of the ridge feature and areas adjacent to the drill pad were negative for cultural materials, but the immediate area around the debitage concentration was never tested.

While no buried components were encountered during initial investigations of the site, the presence of a diagnostic projectile point and a dense artifact concentration representing a knapping activity area suggested that a significant component may be present. Phase I and subsequently Phase II mitigation was recommended.

A total of 20 m² were excavated in a single block focussing on the observed debitage concentration (Appendix B). It was hoped that additional features such as a hearth would be encountered with expanded excavations. Unfortunately, no hearth feature was located, but excavations produced a total of 4,023 artifacts or 201.1 artifacts per 1 m². Lithic materials dominate and account for approximately 99.5% (n=4005), while five fragments of FCR and 13 fragments of faunal remains were also present (Table 25).

Table 25: Summary of Lithic Materials from FhNe 115

Material Type	Early: Reduction Flake	Middle: Shaping Flake	Middle: Thinning Flake	Late: Finishing Flake	Late: Bifacial Reduction Flake	Flake Fragment	Shatter	Core Fragment	Biface	Projectile Point	Fire-cracked Rock	Total
Chalcedony		1										1
Generic Chert	9	10	10	26	1	27	6					89
Granite											3	3
Gronlid Siltstone		1										1
Quartz										1		1
Quartzite	18	16	17	39		72	18					180
Shale	1										1	2
Swan River Chert	315	405	490	711	14	1,102	636	2	1			3,676
Red/Yellow Silicified Sediment	5	11	7	4		21	8					56
Indeterminate											1	1
Total	**348**	**444**	**524**	**780**	**15**	**1,222**	**668**	**2**	**1**	**1**	**5**	**4,010**

Most of the lithic materials from FhNe 15 are locally available. SRC makes up 92% (n=3676) of the lithic assemblage, while generic chert (n=89), quartzite (n=180), a distinct mottled red and yellow silicified sediment (n=56), granite (n=3), shale (n=2), chalcedony (n=1), Gronlid siltstone (n=1), quartz (n=1), and one indeterminate lithic material makes up the remainder.

The lithic assemblage, which was the densest in the center of the excavation block, was comprised primarily of debitage including flakes (n=2,111), shatter (n=668), and unclassifiable flake fragments (n=1,222). The four stages of lithic reduction were represented by early reduction (n=348), middle shaping (n=444), middle thinning (n=524), late finishing (n=780), and late bifacial reduction flakes (n=15). Two core fragments were also present.

Despite the large amount of debitage only two tools were located during excavations. This included a SRC biface and a Hanna projectile point (Photo 52). The recovery of a Hanna type point is consistent with the previously recovered McKean lanceolate, as they are both considered part of the McKean Complex (ca. 4,100 to 3,100 rcybp).

Only five pieces of FCR were identified at FhNe 115, as well as 13 fragments of unidentified bone. Ten of the bone fragments were calcined/burned, while the remaining three pieces consist of unburned enamel fragments. Although the sparse amounts of FCR and burned bone fragments were found in the same general area, no feature was identified.

Photo 52: Tools from FhNe 115
From left to right: Hanna Projectile Point (Cat. #2061), Biface (Cat. #3150)

The artifact density at FhNe 115 suggests that this site represents a small but intensively used lithic reduction locality. Once again, all stages of lithic reduction are represented indicating tool production was the objective. Although minor amounts of FCR and calcined bone fragments were present, no evidence of a hearth feature was observed. The recovery of a Hanna projectile point indicates this site was occupied some 4,100 to 3,100 rcybp.

3.2.4 FhNe 120

FhNe 120 is located on the east valley crest of the East Ravine, approximately 700 m northwest of its confluence with the Saskatchewan River (Photo 53). Vegetation at this site is characterized by thick rejuvenating jack pine. While it appears that a large portion of this site has been disturbed by a drill pad (SPF 66), further examination revealed that a portion of the site was still intact.

FhNe 120 was first located by Western Heritage (2006) under Permit No. 06-103 where a lithic scatter was observed during a post-impact assessment of a drill pad. The site was revisited by Golder (2007e) under Permit No. 07-292. A lithic scatter was observed along the drill pad and the access road to the north. A total of 10 shovel tests were subsequently placed adjacent to the surface finds; however, these tests did not produce any cultural materials. The site was revisited again by Golder (2009b) during the inventory assessment under Permit No. 08-094. A total of 89 shovel probes were excavated in the intact areas around the drill pad. Four tests at the south end of the drill pad along the crest of the East Ravine were positive, producing three SRC debitage, one quartzite core, and one large fragment of FCR (Golder 2009b).

Photo 53: View of FhNe 120

Based on the four, albeit sparse, positive tests, FhNe 120 were selected for Phase I and subsequently Phase II mitigation where a total of 20 m² were excavated. The excavation consisted of two blocks (Appendix B). The southern block was comprised of 11 m^2 placed on the ravine edge, and focussed on a very distinct hearth/pit feature found in 200N 198E and 201N 198E (Photo 54). The second block located approximately 11 m north consisted of 9 m^2 where a sparse distribution of debitage was found.

A total of 899 artifacts were recovered, or an average of 45 artifacts per 1 m². Unlike any other site discussed in this report, FCR dominates and accounts for 64% (n=572; n=3594.3 g) of the entire artifact assemblage (Table 26). Virtually all of this material is associated with the hearth feature. Lithic materials (n=327) make up the remainder of the assemblage, with no faunal remains recovered. The majority of debitage occurs in the north block (n=313), with only a minor frequency (n=35) of lithic materials coming from the south block where the hearth feature was found.

The lithic materials represented at FhNe 120 are all locally available. This included SRC (n=307), quartz (n=15), generic chert (n=4), and Gronlid siltstone (n=1). The lithic assemblage was comprised primarily of debitage including flakes (n=110), unclassifiable flake fragments (n=146), shatter (n=64), and one core fragment. The flakes represent all stages of lithic reduction including early (n=32), middle shaping (n=41), middle thinning (n=14), late finishing (n=23), and late bifacial reduction flakes (n=2).

FhNe 120 produced four tools. This included a retouched SRC flake, a generic chert MURL, a SRC end scraper from the north block, and one Early Side-notched projectile point from the south block (202N 198E) (Photo 55).

Photo 54: Heath Feature in 200N 198E

Table 26: Summary of Lithic Materials from FhNe 120

Material Type	Early: Reduction Flake	Middle: Shaping Flake	Middle: Thinning Flake	Late: Finishing Flake	Late: Bifacial Reduction Flake	Flake Fragment	Shatter	Core Fragment	End Scraper	Retouched Flake	MURL	Projectile Point	Fire-cracked Rock	Total
Generic Chert		1				2					1			4
Granite													572	572
Gronlid Siltstone							1							1
Quartz	1	2		2		5	4	1						15
Swan River Chert	31	38	14	21	2	139	59		1	1		1		307
Total	**32**	**41**	**14**	**23**	**2**	**146**	**64**	**1**	**1**	**1**	**1**	**1**	**572**	**899**

Photo 55: Tools from FhNe 120
From left to right: End Scraper (Cat. #902), Early Side-notched Projectile Point (Cat. #903)

The hearth feature was oval in planview measuring 70 cm long by 50 cm wide with a basin-shaped profile that extended from approximately 20 cm to 45 cm below surface. A very distinct black stained soil with charcoal fragments was evident in the surrounding yellow sand. The feature emerged at the bottom of Level 2 and extended to the bottom of Level 5. The concentration of FCR was found within this feature and consisted of thermally altered and broken granite cobbles. The Early Side-notched point located 2 m to the north of the hearth was collected from Level 3, suggesting it is from the same living floor as this feature.

FhNe 120 is unique from other sites in the region. Although most consist of a concentration of debitage with no associated features, FhNe 120 is the opposite with a distinct feature and few artifacts. This is especially true of the area immediately surrounding the hearth feature, which suggests a different activity was occurring here. The same ratio of early, middle, and late stage flakes were found around the hearth as in the north block, just in fewer numbers, which indicates the hearth was associated with similar, yet much less intensive lithic reduction activities. The matrix from the hearth feature was removed separately and put through 1/8" mesh screen in the Golder lab. The fact that no fragmented burned/calcined bone was found in this or surrounding matrix suggests that the hearth was not associated with intensive food processing, such as grease or bone marrow extraction. Although the exact function of the feature is not known (boiling pit or sweat lodge?), it is clear that the area surrounding it was kept relatively clear of debris, with more lithic reduction occurring to the north. The Early Side-notched points suggest the site was occupied sometime between 7,500 to 5,000 rcybp.

Although FhNe 120 was the only site in the study area to have a clearly defined hearth feature with an associated projectile point, previous testing along the ravine edge did not indicate there was an extensive occupation, and the excavation block sufficiently captured the feature and surrounding area. Phase III mitigation was not recommended.

3.2.5 FhNe 138

FhNe 138 is located in a low wet area 280 m west of 101 Ravine (Photo 56). The Saskatchewan River is located approximately 4.5 km southeast of the site. The site was found within a natural opening in thick aspen in a low lying area that borders a muskeg to the west. Vegetation consists of thick grass, willow, aspen, and spruce saplings.

Photo 56: View of FhNe 138

FhNe 138 was located by Golder under Permit No. 08-094 during an HRIA for the proposed Star-Orion South Diamond Project. Three shovel tests placed 5 m apart in this clearing were positive, producing a total of five debitage associated with a potential palaeosol 20 cm to 30 cm below surface. Surrounding tests were negative suggesting a limited site area. Debitage (n=3) was identified in a shovel test in the clearing approximately 20 cm to 30 cm below surface.

Based on the possible association of a buried component with a visible palaeosol, FhNe 138 was selected for Phase I and subsequently Phase II mitigation, where a total of 20 m² were excavated. The excavation began by opening a 1 m by 2 m test unit adjacent to each of the three positive shovel tests (Appendix B). The central test was ultimately the most productive and resulted in an excavation block consisting of 16 m² focussed on a lithic reduction area. A total of 1,213 artifacts were recovered, or an average of 60.6 artifacts per 1 m². Lithic materials dominate and account for 95% of the entire artifact assemblage. One piece of FCR and 94 faunal remains were also present.

The lithic materials represented at FhNe 138 are all locally available (Table 27). SRC comprises approximately 90% (n=1090) of the lithic assemblage, followed by quartz (n=99). A variety of other materials were present in lesser numbers including generic chert (n=14), granite (n=2), Gronlid siltstone (n=6), chalcedony (n=1), and quartzite (n=1).

Table 27: Summary of Lithic Materials from FhNe 138

Material Type	Early: Reduction Flake	Middle: Shaping Flake	Middle: Thinning Flake	Late: Finishing Flake	Late: Bifacial Reduction Flake	Flake Fragment	Shatter	Nodule	Core Fragment	End Scraper	MURL	Biface	Biface Preform	Fire-cracked Rock	Total
Generic Chert	3	1	2	1		5	2								14
Granite	1	0												1	2
Gronlid Siltstone	1	1		3			1								6
Chalcedony		0									1				1
Quartz	6	3	1	3		34	49		3						99
Quartzite		0							1						1
Swan River Chert	83	108	89	80	4	374	338	1	10	1		1	1		1,090
Total	**94**	**113**	**92**	**87**	**4**	**413**	**390**	**1**	**14**	**1**	**1**	**1**	**1**	**1**	**1,213**

Artifacts were heavily concentrated in the mid-western portion of the block and were comprised primarily of debitage including flakes (n=386), shatter (n=390), and unclassifiable flake fragments (n=413). The flakes represent all stages of lithic reduction including early (n=94), middle shaping (n=113), middle thinning (n=92), late finishing (n=87), and late bifacial reduction flakes (n=4). Additional artifacts include core fragments (n=15) and a SRC nodule (n=1). Four tools included an end scraper (n=1), MURL (n=1), biface preform (n=1), and a biface (n=1) (Photo 57).

Only one piece of granite FCR was identified at FhNe 138. In addition to the FCR, 94 faunal remains were also present. This consisted mainly of unidentifiable fragments (n=63) and unidentifiable calcined/burned fragments (n=27); however, one large ungulate vertebrae (n=1) and two large ungulate bone fragments were also recovered. No hearth features were identified.

The stratigraphy at FhNe 138 is more complex than other sites in the FALC Provincial Forest. Because it is located in a low area adjacent to a muskeg, it is subject to periods of water accumulation and flooding, which has resulted in a series of buried organic layers within the top 30 cm (Photo 58). This was evident during Phase I mitigation, which occurred the day after a significant rain storm. The sand was water saturated and standing water was encountered at approximately 40 cm to 50 cm below surface. When Phase II mitigation was resumed several weeks later under dry conditions, the site was completely dry allowing excavation to 70 cm below surface.

After initial testing it was hoped that a distinct occupation might be associated with, or separated by, one or more of the organic layers. However, it became apparent that the site was heavily disturbed by rodent activity, which resulted in the displacement of artifacts throughout the site from Level 1 through Level 7. As a result, a distinct occupation level(s) could not be discerned. However, the densest concentration of artifacts came from the sand below the dark organic layers in Level 4 (30 cm to 40 cm DBS). This suggests that the site was occupied during a time of instability in the sands perhaps when the area was drier, and prior to the development of a stable ground surface as represented by the dark organic layers.

Photo 57: Tools from FhNe 138
From left to right: MURL (Cat. #130), End Scraper (Cat. #867), Biface Preform (Cat. #1478), Biface (Cat. #1513)

Photo 58: Stratigraphy at FhNe 138

The high density of debitage from FhNe 138 indicates the site was intensively used as a lithic reduction locality for tool production. Although, the water saturated soils resulted in better preservation of bone at the site in the form of larger identifiable ungulate fragments, the site has been extensively disturbed through rodent disturbance. When this is combined with a lack of identifiable feature or diagnostic tools, Phase III mitigation was not recommended.

3.3 Phase III Mitigation

At the conclusion of Phase II mitigation, two sites stood out as having the greatest artifact density, variety of artifact classes, and site size, and thus the greatest scientific potential for interpretation: FhNe 11 and FhNe 88. Both sites are located within the proposed Star Open Pit. FhNe 11 is located on a prominent hill overlooking the Saskatchewan River and various ravines to the southeast, and FhNe 88 is located along the East Ravine (Figure 3). These sites received a total of 80 m^2 of excavation each and are discussed below. Artifact density plots for each site can be found in Appendix B.

3.3.1 FhNe 11

FhNe 11 is located at the base of a prominent landform known locally as Spy Hill (Photos 59 and 60). Spy Hill is found along the eastern edge of an upland that provides a unique vantage point of the study area looking toward the East Ravine. The Saskatchewan River valley, located 3 km southeast, is also visible from this location (Figure 3). Hummocky sand dune terrain is found to the west of the site, while the landscape southeast of the upland slopes toward a low muskeg located approximately 600 m away. Spy Hill and much of the surrounding terrain is in open grassland with sparse regenerating jack pine; however, an aspen bluff is located at the base of the hill.

The site was originally identified under Permit No. 04-102 during HRIA of a proposed drill pad and access road (Golder 2005). A dense debitage scatter was noted on a bladed trail that passed along the base of Spy Hill to Kimberlite Bodies 134 and 101. A subsequent recommendation was made to berm off the existing trail to limit vehicular access and prevent further impacts to the site.

Given the density of artifacts on such a prominent landform, FhNe 11 was subject to Phase I excavation. The results of these initial excavations warranted further Phase II, and Phase III mitigation. Excavations focussed on two activity areas (Appendix B). Block A consisted of 29 m^2 that centered on the original artifact scatter exposed on the trail (Photo 61). Block B consisted of 15 m^2 located 5 m south in a second artifact concentration. In order to systematically test the site area, eighteen units were subsequently placed along four lines oriented east-west and spaced at 10 m intervals across the site. Two of these units were expanded based on artifact results. The remaining units were placed in areas of surface scatters and finds, and were also expanded based on artifact recovery. A 2 m by 3 m block (C) and a 2 m by 2 m block (D) were opened up east of the main excavation, and one 2 m by 2 m block (E) was expanded to the north.

In total, 80 m^2 were excavated and 26,304 artifacts were recovered, or an average of 328.8 artifacts per 1 m^2. Lithic materials consisting of debitage, cores, and tools dominate, and account for 97% of the entire artifact assemblage (Table 28). FCR represents 1% of the assemblage, while faunal remains account for 3% of the assemblage. Artifact density maps of the three artifact classes can be found in Appendix B.

Figure 3: Location of Known Heritage Resources Recommended for Phase III Mitigation in Star-Orion South Diamond Project Area

Photo 59: View south across FhNe 11 from Spy Hill

Photo 60: View of Spy Hill from FhNe 11 Block B

Photo 61: View of FhNe 11 Block A

Table 28: Summary of Lithic Materials from FhNe 11

Material Type	Early: Reduction Flake	Middle: Shaping Flake	Middle: Thinning Flake	Late: Finishing Flake	Late: Bifacial Reduction	Flake Fragment	Shatter	Core Fragment	Tools	Fire-cracked Rock	Total
Chalcedony	2	10	21	3		18	21				75
Chert	45	52	59	23	2	97	64	1	2		345
Quartz	1	2	2			18	47	1			71
Quartzite	7	3	16	1		16	15			2	60
Swan River Chert	1,181	1,436	1,166	1301	17	9,115	9,747	34	35	1	24,033
Gneiss									1	22	23
Gronlid Siltstone	72	41	27	44		209	112		2		507
Indeterminate Igneous										4	4
Indeterminate Metamorphic										4	4
Knife River Flint						2					2
Red River Chert	2										2
Red/Yellow Silicified	1	2	4	5		10	4				52

Sediment											
Sandstone							4			68	72
Schist										18	18
Shale	2									2	4
Silicified Sediment	2	2	1	2		5	1				13
Granite						1				117	118
Total	**1,315**	**1,548**	**1,296**	**1,379**	**19**	**9,491**	**10,015**	**36**	**40**	**238**	**25,403**

The majority of lithic materials represented at FhNe 11 are locally available. SRC makes up 96% (n=24,033) of the lithic assemblage. Other notable lithic materials include Gronlid siltstone 2.0% (n=507) and generic chert 1% (n=345). The remainder of the lithic materials consist of chalcedony (n=75), quartz (n=71), and quartzite (n=60), with minor amounts of Red River Chert (n=2). A distinct mottled red and yellow silicified sediment is also present (n=52). FCR material consisted of gneiss (n=23), indeterminate igneous (n=4), indeterminate metamorphic (n=4), sandstone (n=72), schist (n=18), shale (n=4), and granite (n=118).

Non-local lithic materials include Knife River Flint (n=2). Knife River Flint has a primary bedrock source in west-central North Dakota (Clayton et al. 1970; Fedirchuk and McCullough 1992:76). The presence of exotic lithic materials indicates they were either traded for or carried to the site from great distances.

The lithic assemblage was comprised almost exclusively of debitage, including flakes (n=5,557), shatter (n=10,015), and unclassifiable flake fragments (n=9,491). The flakes represent all stages of lithic reduction including early (n=1,315), middle shaping (n=1,548), middle thinning (n=1,296), late finishing flakes (n=1,379), and bifacial reduction flakes (n=19). Core fragments (n=36) were also recovered. There was no significant difference in the ratio of flake types, which suggests that all stages of reduction were taking place at FhNe 11.

A significant number of tools (n=40) were recovered from FhNe 11 (Table 29). This included marginally utilized or retouched lithic materials, also known as MURLs (n=4). MURLs are expediency tools, in which existing flakes show signs of use, where either the natural edge of the flake has been used as a cutting or scraping tool, or the edge has been slightly retouched to create a suitable edge.

Table 29: Summary of Tools from FhNe 11

Material Type	End Scraper	End/Side Scraper	Biface	MURL	Hammerstone	Projectile Preform	Projectile Point	Total
Chert		2						2
Swan River Chert	7	5	16	3		1	3	35
Gneiss					1			1
Gronlid Siltstone	1			1				2
Total	**8**	**7**	**16**	**4**	**1**	**1**	**3**	**40**

An array of end (n=8) and end/side scrapers (n=7) are present at FhNe 11 (Photos 62, 63, and 64). Scrapers are tools that have been more obviously shaped and unifacially retouched to be used in the processing of hides. They occur at FhNe 11 in a variety of rectangular, ovoid, and triangular forms.

Photo 62: Scrapers from FhNe 11
From left to right Cat. #178, #1993, #4909, #5075, #7345

Photo 63: Scrapers from FhNe 11
From left to right Cat. #7346, #9903, #9904, #9935, #10137

Photo 64: Scrapers from FhNe 11
From left to right: Cat. #11957, #12978, #13086, #13697, #14906

Bifaces are tools that have been bifacially reduced to produce a cutting edge or form a blank (Photo 65). A variety of bifaces (n=16) are present at FhNe 11, ranging from finely retouched ovoid knives through to crude discoidal blanks or preforms.

One cobble of gneiss exhibits battering on either end, which suggests use a hammerstone (Photo 66). This tool was most likely used in lithic reduction as a hard hammer percussion tool; however, other uses, such as the crushing of long bones in marrow, processing is possible.

Most significantly was the recovery of three Duncan/Hanna projectile points, as represented by two bases and one almost complete point (Photo 67). These projectile points belong to the McKean Complex, which dates from ca. 4,100 to 3,100 rcybp (Dyck 1983; Walker 1999). Metric attributes are located in Appendix C.

FCR (n=238) accounts for approximately 1% of the entire artifact assemblage and is represented by a variety of lithic material although granite and sandstone are the most prevalent. The distribution of FCR corresponds generally with the debitage activity areas; however, it is not concentrated in a specific pattern to indicate any hearth localities. Rather, the small fragments of FCR, in which 61% are less than 3 cm in size, are lightly distributed throughout the excavation blocks.

Faunal remains contribute 3% (n=901) of the artifact assemblage, the majority of which are unidentifiable calcined/burned fragments (n=820). The remaining assemblage consists of unburned fragments (n=58), unburned large ungulate enamel fragments (n=18), and a fragmentary portion of one unburned left astragalus from a large ungulate, likely bison. Similar to the FCR, bone fragments are distributed throughout the activity areas, with slightly greater concentrations in Block B, and another concentration in Block E.

The presence of FCR and comminuted bone suggests that one or several hearth or boiling pit features were nearby, although none were noted during excavation. Bone from butchered animals appears to have been crushed and processed (boiled) for grease rendering. This practice was observed amongst historically known aboriginal groups on the Northern Plains. Nutrient and fat rich marrow was a source of high energy that also enhanced the flavour of food (Kooyman 2000).

Photo 65: Bifaces from FhNe 11
From left to right: Cat. #9902, #10020, #11872, #13744, #17970, #17971, #20157

Photo 66: Hammerstone form FhNe 11 (Cat. #26436)

Photo 67: Projectile Points from FhNe 11
From left to right: Hanna Projectile Point (Cat. #26435), Duncan/Hanna Projectile Point Bases (Cat. #26435, #10019), Projectile Point Preform (Cat. #6844)

The density and variety of artifacts found at FhNe 11 indicates the site was likely used as a camping and lithic reduction locality dating to ca. 4,100 to 3,100 rcybp. Excavations focussed on two activity areas that exhibited a dense concentration of lithic debitage indicating that lithic reduction and tool manufacturing was the primary activity. However, the presence of bone, FCR, and other tools involved with food and hide processing also suggest potentially longer term camping activities were occurring. Test excavation units beyond the main excavation blocks suggest that additional activity areas exist. Regardless, a significant sample of FhNe 11 has been excavated to allow interpretation.

3.3.2 FhNe 88

FhNe 88 is located approximately 1.5 km northwest of the Saskatchewan River on a narrow point of land extending west into the valley of the East Ravine (Figure 3; Photo 68). Vegetation consists primarily of an open stand of regenerating jack pine on the landform, with thick aspen and brush on the slopes and ravine below. A portion of the site has been previously disturbed by a 5 m wide bladed trail that bisects the point of land and leads down the steep slope to the ravine below. The site is immediately adjacent to the main East Ravine Road.

Photo 68: View northwest across FhNe 88

FhNe 88 was first identified under Permit No. 05-087 (Western Heritage 2005) and revisited under Permit No. 06-103 while conducting HRIA as part of Star Kimberlite exploration activities (Western Heritage 2006). The equivalent of 9 m^2 was excavated, including 23 shovel tests and two test excavation blocks. This included a 2 m by 2 m block north of the trail, where a Besant point was recovered with over 100 debitage. The second 1 m by 2 m block was opened up approximately 48 m to the southwest, along the southern crest of the ravine, where FCR was exposed on the surface. A Pelican Lake point was recovered from this block in addition to FCR and debitage. In total, 2,200 artifacts were recovered. This included 646 debitage and cores, 1,559 FCR, and two unidentifiable bone fragments, in addition to the diagnostic projectile points mentioned above.

Given the density of artifacts and the recovery of two different diagnostic projectile points from FhNe 88, it was selected for Phase I mitigation and was ultimately subject to all three phases of mitigation. The original units opened by Western Heritage were relocated and excavation began by expanding on these blocks, which were oriented to magnetic north (Appendix B). An additional 4 m² were opened up around the original 2 m by 2 m block north of the trail. These units were not very productive and attention was focused on the 1 m by 2 m unit to the southwest. This became the primary area of excavations where a 46 m^2 block (A) was eventually opened (Photo 69). To test the remainder of the intact landform south of the trail, 1 m^2 test units were placed along three east-west axis at 5 m intervals. Fourteen units were placed along 189N line through the north end of the main excavation Block A, and along the most level portion of the landform. An additional three units were placed along another line 5 m to the south, and two units 10 m to the north. Test units were then expanded based on artifact recoveries. This resulted in a 2 m by 2 m Block B west of the main excavation, and a 2 m by 2 m Block C, and 2 m by 3 m Block D east of the main excavation.

Photo 69: View southeast across FhNe 88 Block A

In total, 80 m^2 were excavated and 8,954 artifacts were recovered, or an average of 111.9 artifacts per 1 m^2. Lithic materials consisting of debitage, cores and tools dominate, and account for 88% of the entire artifact assemblage (Table 30). FCR represents 9% of the assemblage, while faunal remains account for 3% of the assemblage. Artifact density maps of the three artifact classes can be found in Appendix B.

Table 30: Summary of Lithic Materials from FhNe 88

Material Type	Early: Reduction Flake	Middle: Shaping Flake	Middle: Thinning Flake	Late: Finishing Flake	Late: Bifacial Reduction	Flake Fragment	Shatter	Nodule	Core Fragment	Tools	Fire-cracked Rock	Total
Amygdaloidal Andesite										1		1
Arkose	2	2		2		2	8		1			17
Basalt		1										1
Generic Chert	21	8	6			15	9					59
Gneiss											40	40
Granite		1									372	373
Gronlid Siltstone	22	25	9	16		97	42					211
Indeterminate Metamorphic							1				2	3

Indeterminate Igneous	2						1			3	244	250
Indeterminate Sedimentary	2											2
Chalcedony	2	14	3	3	1	26	4			1		54
Mudstone											3	3
Quartz	11	3	2	3		33	51				40	143
Quartzite	5	2	5			21	4					37
Sandstone											13	13
Schist											7	7
Shale	3		2			40	33			2	24	105
Silicified Peat						1						1
Silicified Sediment						1						1
Siltstone						2					28	30
Swan River Chert	679	631	398	685	21	2,685	2,175	3	11	26	45	7,359
Total	**749**	**687**	**425**	**709**	**22**	**2,923**	**2,328**	**3**	**12**	**34**	**818**	**8,711**

The majority of the lithic materials represented at FhNe 88 are locally available. SRC makes up 92% (n=7,314) of the lithic assemblage, followed by quartz (n=103). A number of other types of materials were present but in much smaller numbers such as amygdaloidal andesite (n=1), arkose (n=17), basalt (n=1), chert (n=59), gneiss (n=40), Gronlid siltstone (n=211), chalcedony (n=54), quartzite (n=37), sandstone (n=13), schist (n=7), silicified peat (n=1), silicified sediment (n=1), indeterminate metamorphic (n=1), indeterminate sedimentary (n=3), granite (n=1), shale (n=81), and siltstone (n=2). FCR material consisted of gneiss (n=40), granite (n=372), indeterminate metamorphic (n=2), indeterminate igneous (n=244), mudstone (n=3), quartz (n=40), sandstone (n=13), schist (n=7), siltstone (n=28). Forty-five pieces of SRC were identified as FCR, but this likely reflects an attempt at heat treatment of this material for further reduction.

The lithic assemblage was comprised almost exclusively of debitage, including flakes (n=2,592), shatter (n=2,328), and unclassifiable flake fragments (n=2,923). The flakes represent all stages of lithic reduction including early (n=749), middle shaping (n=687), middle thinning (n=425), late finishing flakes (n=709), and late bifacial reduction flakes (n=22). Core fragments (n=12) and SRC nodules (n=3) were also recovered.

A significant number of tools (n=34) were located at FhNe 88 (Table 31). This included marginally utilized or retouched lithic materials, also known as MURLs (n=1). MURLS are expediency tools, in which existing flakes show signs of use, where either the natural edge of the flake has been used as a cutting or scraping tool, or the edge has been slightly retouched to create a suitable edge.

Five end scrapers were located at FhNe 88 (Photo 70). End scrapers are tools that have been more obviously shaped and unifacially retouched to be used in the processing of hides. They occur at FhNe 88 in a variety of triangular and rectangular forms. A unifacial preform was also recovered.

Table 31: Summary of Tools from FhNe 88

Material Type	Retouched Flake	End Scraper	Biface	MURL	Hammerstone	Unifacial Preform	Bifacial Preform	Projectile Point Preform	Projectile Point	Utilized Slab	Total
Amygdaloidal Andesite					1						1
Indeterminate Igneous					3						3
Chalcedony				1							1
Shale	2									1	3
Swan River Chert	2	5	5			1	2	2	10		27
Total	**4**	**5**	**5**	**1**	**4**	**1**	**2**	**2**	**10**	**1**	**35**

Photo 70: End scrapers from FhNe 88
From left to right Cat. #1957, #6130, #6575, #6973, #8981

Bifaces are tools that have been bifacially reduced to produce a cutting edge or form a blank (Photo 71). A variety of bifaces (n=5) were recovered from this site mainly consisting of ovoid biface fragments and preforms (n=2).

Evidence of battering was observed on four cobbles, which suggests use as a hammerstone (Photo 72). These cobbles were likely used during lithic reduction as a hard hammer percussion tools. A utilized stone slab also exhibited signs of pitting, which suggests use as an anvil.

A large number of projectile points were recovered from site FhNe 88 (n=12) (Photos 73 and 74). This includes nine diagnostic points recovered from excavation Block A (n=6), Block C (n=1), and Block D (n=2). The points consists of Late Period points including three non-descript side-notched forms and one broken triangular point or preform, one Pelican Lake point, three Duncan/Hanna points, and one Oxbow preform. The remaining non-diagnostic points consist of two projectile point bodies that cannot be classified, and a portion of a stemmed base that may also represent a Hanna point.

Photo 71: Bifaces from FhNe 88
From left to right Cat. #511, #2862, #6108, #6497, #6543, #6607, #6861

Photo 72: Hammerstone from FhNe 88 (Cat. #3985)

Photo 73: Projectile Points from FhNe 88
From left to right: Late Side-notched Projectile Points (Cat. #3712, #3713), Late Period Projectile Point Base (Cat. #1955), Broken Triangular Point (Cat. #2142), Pelican Lake Projectile Point (Cat. #6124)

Photo 74: Projectile Points from FhNe 88
From left to right: Duncan/Hanna Projectile Points (Cat. #8982, #6138, #6417), Oxbow Preform (Cat. #373), Projectile Point Body Fragments (Cat. #5411, #4305), Projectile Point Base (Cat. #2641)

As Table 32 indicates, the Oxbow, Hanna, and one Late Side-notched point from Block A were recovered from Level 1 (0 cm to 10 cm DBS), while the remaining three Late Side-notched points were recovered from Level 2 (10 cm to 20 cm DBS). The two Hanna points from Block D and the one Pelican Lake point from Block C were also recovered from Level 1. The presence of diagnostic projectile points representing approximately 5,000 years of occupation all present within the top 10 cm to 20 cm indicates that FhNe 88 is a multi-component site with a collapsed or mixed stratigraphy. This makes the separation of artifacts into discrete occupation levels virtually impossible, and demonstrates the lack of stratigraphic separation present throughout the sandy terrain of the FALC Provincial Forest.

Table 32: Summary of Identifiable Projectile Points from FhNe 88

Catalogue No.	Unit Northing	Unit Easting	Excavation Block	Level	Depth (cm)	Notes	Typology
373	185	171	A	1	0-10	Preform	Oxbow
1955	185	170	A	1	0-10	Base	Late Side-notched
6124	185	179	C	1	0-10	Complete	Pelican Lake
6138	190	199	D	1	0-10	Base	Hanna
6417	189	201	D	1	0-10	Complete	Hanna
8982	190	168	A	1	0-10	Complete	Duncan/Hanna
2142	185	170	A	2	10-20	Broken	Late Triangular/Preform
3712	186	171	A	2	10-20	Complete	Late Side-notched
3713	186	171	A	2	10-20	Complete	Late Side-notched

FCR represents approximately 9% (n=818) of the entire artifact assemblage and is represented by a variety of lithic materials. The most common FCR material is granite and an unidentifiable type of igneous rock. The highest densities of FCR occur in Block A and Block D that corresponds with the high frequency of debitage in these areas. Although no distinct hearth or soil staining was evident, concentrations of FCR in these areas may represent a disposal area for FCR that was used in a nearby hearth feature.

Faunal remains contribute 3% (n=244) of the sites artifact assemblage, the majority of these remains are unidentifiable, burnt, and calcined fragments (n=233). The remaining assemblage consists of unburned fragments (n=9) and two enamel fragments. The highest frequency of bone correlates with increased densities of debitage and FCR in excavation Block A and Block D. The presence of FCR and heavily fragmented, calcined bone suggests that hearth features are nearby excavation Block A and Block D. Unfortunately, no such features could be identified during excavation.

The results of excavations at FhNe 88 indicate that this location was repeatedly occupied for the last 5,000 years. Unfortunately, the collapsed stratigraphy does not allow more meaningful interpretations according to separate and discrete occupations. As a result, artifact and feature associations are impossible, and it cannot be determined if people were engaged in different types of activities through time. Regardless, FhNe 88 appears to be similar to other sites in the region where lithic reduction and tool production was the primary activity. Although FCR and bone fragments were observed at the site, these artifact classes would be expected in much higher numbers if intensive game processing was the main activity.

4.0 INTERPRETATIONS

Results from the mitigation program allow interpretations with respect to the original research design questions outlined in the inventory assessment report for the Star-Orion South Diamond Project (Golder 2009b). The main objectives relate to the basic questions of scientific inquiry. Who was occupying the study area, when, what activities were they engaged in and how were they utilizing/occupying the landscape. These questions are addressed below.

4.1 Culture History Interpretations

The Star-Orion South Diamond Project mitigation has resulted in the recovery of diagnostic materials that assist in interpreting the relatively undocumented Precontact culture history of the FALC Provincial Forest. Ten of the sites selected for mitigation produced culturally diagnostic points that range from Early Side-notched (7,500 to 5,000 rcybp) to Late Side-notched (1,200 to 250 rcybp). When the results of the mitigation program are considered with previous assessment results in the study area, a total of 30 diagnostic projectile points have been recovered from 19 sites (Table 33). To date there is evidence for occupation of the FALC Provincial Forest from the Palaeo-Indian Period through to the Late Precontact Period.

Table 33: Summary of Heritage Resources with Culturally Diagnostic Tools/Projectile Points

Borden No.	Site Type	Cultural Affiliation
FhNe 27*	Artifact Scatter	Late Side-notched (n=2)
FhNe 34*	Artifact Scatter	Late Side-notched
FhNe 88*	Artifact Scatter	Late Side-notched (n=3)
FhNe 145	Artifact Find	Avonlea
FhNe 88*	Artifact Scatter	Besant
FhNe 88*	Artifact Scatter	Pelican Lake
FhNe 129	Artifact Scatter	Pelican Lake
FhNe 82b*	Artifact Scatter	Pelican Lake
FhNe 87*	Artifact Find	Pelican Lake
FhNf 59*	Artifact Scatter	Pelican Lake
FhNe 115*	Artifact Scatter	McKean lanceolate; Hanna
FhNe 11*	Artifact Scatter	Duncan/Hanna (McKean) (n=3)
FhNe 86	Artifact/Feature Combination	Hanna
FhNe 88*	Artifact Scatter	Hanna (n=3)
FhNe 90	Artifact Scatter	Hanna
FhNe 111	Artifact Scatter	Hanna
FhNf 34	Artifact Find	Middle Precontact Corner-notched
FhNe 88*	Artifact Scatter	Oxbow
FhNe 55	Artifact Scatter	Early Side-notched
FhNe 114	Artifact Scatter	Early Side-notched

FhNe 98*	Artifact Scatter	Early Side-notched
FhNe 120*	Artifact/Feature Combination	Early Side-notched
FhNe 54	Artifact Find	Cody knife

* Excavated under Permit No. 08-145.

The data from the project area is compared with previous archaeological studies in the region including the Nipawin Reservoir heritage study (Burley et al. 1982); the Forks survey (Wilson 1982); and the James Smith Reserve archaeological survey (Meyer and Klimko 1986), as well as others, to assist in interpreting the culture history study area.

4.1.1 The Early Precontact Period

Only one site from the Early Precontact or Palaeo-Indian period has been identified in the study area. A Cody knife (Photo 75) was recovered from FhNe 54, located approximately 4.5 km north of the Star-Orion South Diamond Project. The Cody knife was found in a disturbed context on the surface of a bladed trail adjacent to a pond (Golder 2005). The currently accepted dates for the Cody Complex in the Northern Plains are between ca. 9,500 to 8,400 rcybp (Dyck 1983; Walker 1999); however, only three Cody Complex sites in Saskatchewan have been radiocarbon dated (Table 34). These include the Napao (DkNv 2) (Morlan 1993), Niska (DkNu 3) (Meyer 1985), and Heron Eden (EeOi 11) (Corbeil 1995) sites from southern Saskatchewan. Of these, the Heron Eden site appears to have produced the most reliable dates, which cluster around 9,000 rcybp.

Photo 75: Reverse face of heavily reworked quartz Cody knife

Table 34: Selected Cody Radiocarbon Dates

Site	Normalized Age (rcybp)	Lab No.	Reference
Heron Eden (EeOi 11)	8240 ± 200	S-3208	Linnamae and Cazakoff (1990)
Heron Eden (EeOi 11)	9010 ± 120	S-3114	Linnamae and Cazakoff (1990)
Heron Eden (EeOi 11)	9000 ± 130	S-3309	Linnamae and Cazakoff (1990)
Heron Eden (EeOi 11)	9290 ± 110	S-3308	Linnamae and Cazakoff (1990)
Heron Eden (EeOi 11)	10290 ± 100	S-3118	Linnamae and Cazakoff (1990)
Napao (DkNv 2)	4769 ± 365	S-2569*	Morlan (1993)
Napao (DkNv 2)	6715 ± 205	S-2891	Morlan (1993)
Napao (DkNv 2)	8155 ± 230	S-2890	Morlan (1993)
Niska (DkNu 3)	5910 ± 270*	S-2235*	Meyer (1985)
Niska (DkNu 3)	7000 ± 185	S-2353	Meyer (1985)
Niska (DkNu 3)	8475 ± 650	S-2510	Meyer (1985)
Niska (DkNu 3)	3100 ± 80*	TO-362	Meyer and Liboiron (1990)
Niska (DkNu 3)	10880 ± 70*	TO-956	Meyer and Liboiron (1990)
Niska (DkNu 3)	6170 ± 70*	TO-934*	Meyer and Liboiron (1990)
Niska (DkNu 3)	7245 ± 320	S-2453	Meyer (1985)

* Indicates rejected dates.

A site of this age, while rare, is not unexpected for the study area as central Saskatchewan would have been free of ice from the Wisconsin glaciation by this time. In fact, as indicated in Section 2.2, during the Cody Complex era the FALC Sand Hills would have resided along the northern margins of a grassland and parkland environment. This occupation would also have corresponded with the first period of dune activity in the sand hills, which occurred between 12,800 to 8,400 rcybp, as part of the transition between the post glacial boreal environment to a warmer parkland-grassland environment.

It should be noted however, that it is not until the subsequent terminal Palaeo-Indian Period that there is evidence of more intensive usage of the Saskatchewan River valley by Precontact peoples (McKeand 1995). This is represented by lanceolate projectile points similar to the Angostura type (8,500 to 7,500 rcybp) that have been recovered throughout central and east-central Saskatchewan. This includes five sites identified during the Nipawin Reservoir heritage study (Burly et. al. 1982), 10 sites from the Forks survey area (Wilson 1982), as well as one site near Birch Hills (Fenton Ferry site) and the St. Louis site (FfNk 7).

4.1.2 The Middle Precontact Period

The majority of sites (n=15) with diagnostic points in the FALC Provincial Forest date to the subsequent Middle Precontact Period. It should be recognized however, that this period is also the longest, spanning approximately 5,500 years (7,500 to 2,000 rcybp).

The earliest cultural complex associated with the Middle Precontact Period found in the project area is the Early Side-notched. A total of four sites (FhNe 55, 98, 114, and 120) with diagnostic Early Side-notched points were identified in the project area. Sites from this period are known along the Saskatchewan River, with 13 sites identified during the Forks survey (Wilson 1982) and 16 sites identified during the Nipawin study (Burley et al. 1982).

The currently accepted date for Early Side-notched occupations on the Northern Plains is between ca. 7,500 to 5,000 rcybp. Radiocarbon dates from Early Side-notched sites located in central Saskatchewan are provided in Table 35. Of particular interest are dates from the Below Forks site located approximately 25 km upstream from the Star-Orion South Diamond Project area that produced multiple radiocarbon dates that cluster around 6,000 rcybp (Meyer 2003). A possible Early Side-notched occupation at the St. Louis site located on the South Saskatchewan River approximately 70 km southwest of the project area also produced a date of 6,220+/-70 rcybp (Amundson et al. 2005). It seems likely, then, that Early Side-notched occupations from the project area also date to ca. 6,000 rcybp.

Table 35: Selected Early Side-notch Radiocarbon Dates

Site	Normalized Age (rcybp)	Lab No.	Reference
Below Forks (FhNg 25)	4140 ± 270	S-2034	Dyck (1983)
Below Forks (FhNg 25)	5740 ± 100	S-1994	Dyck (1983)
Below Forks (FhNg 25)	5925 ± 140	S-2245	Dyck (1983)
Below Forks (FhNg 25)	6010 ± 80	TO-9355	Meyer (2003)
Below Forks (FhNg 25)	6100 ± 140	TO-9354	Meyer (2003)
Below Forks (FhNg 25)	5920 ± 60	TO-11027	Meyer (2003)
Gowen 1 (FaNq 25)	4810 ± 130*	S-1526	Walker (1980)
Gowen 1 (FaNq 25)	5750 ± 140	S-1527	Walker (1980)
Gowen 1 (FaNq 25)	5760 ± 140	S-1448	Walker (1980)
Gowen 1 (FaNq 25)	6150 ± 200	S-1488	Walker (1980)
Gowen 1 (FaNq 25)	6230 ± 110	S-1457	Walker (1980)
Gowen 2 (FaNq 32)	5160 ± 150	S-2036 A	Walker (1980)
Gowen 2 (FaNq 32)	5670 ± 110	S-2037	Walker (1980)
Gowen 2 (FaNq 32)	5990 ± 170	S-2036 B	Walker (1980)
Gowen 2 (FaNq 32)	6000 ± 130	S-1970	Walker (1980)
Gowen 2 (FaNq 32)	6160 ± 160	S-1971	Walker (1980)
Gowen 2 (FaNq 32)	5863 ± 55	NZA-15746	Leyden (2004)
Norby (FaNq 56)	5640 ± 120	S-3206	Zurburg (1991)
Norby (FaNq 56)	5820 ± 110	S-3205	Zurburg (1991)
Norby (FaNq 56)	5965 ± 265	S-3006	Zurburg (1991)
Norby (FaNq 56)	7036 ± 45*	NZA-15747	Leyden (2004)
St. Louis (FfNk 7) (possible Mummy Cave)	6220 ± 70	Beta-173611	Amundson et al. (2005)

* Indicates rejected dates.

As discussed in Section 2.2, this period of occupation in the FALC Provincial Forest would have corresponded with a period of increased aridity and associated reduction in vegetation cover (Wolfe et al. 2005). Known as the Altithermal or Hypsithermal, this period was characterized by a general increase in temperature and a decrease in available moisture. Another result of this warming trend was the migration of the Boreal Forest - Parkland border by as much as 100 km north of its present day position. This warming trend also corresponded with the second and final period of sand dune activity in the FALC Sand Hills (Wolfe et al. 2005).

Following the Early Side-notched presence in the FALC Provincial Forest, there is evidence for Oxbow occupation at one site in the study area. FhNe 88 produced a projectile point preform that has the characteristic

basal “ears” of Oxbow points. This phase is well represented in the region and is considered the first intensive occupation on the Saskatchewan River, with 23 sites identified during the Nipawin Reservoir survey, 19 Oxbow sites identified during the Forks survey (Wilson 1982) and one site recorded during the James Smith Reserve archaeological survey (Meyer and Klimko 1986).

The Oxbow Phase appeared on the plains approximately 4,700 rcybp, and is thought to have extended until 3,000 rcybp (Dyck 1983; Walker 1999). Radiocarbon dates from Oxbow sites located in central Saskatchewan are provided in Table 36. The occupation at the Below Forks site produced early Oxbow dates (4750+/-90, 4790+/-70), as did the lone date from the St. Louis site (4590+/-60), suggesting an early presence of Oxbow people in the Saskatchewan River system, and likely within the FALC Provincial Forest. Given the density of Oxbow sites found along the Saskatchewan River, it is perhaps surprising that there is not a greater presence in the FALC Provincial Forest.

Table 36: Selected Oxbow Radiocarbon Dates

Site	Normalized Age (rcybp)	Lab No.	Reference
Moon Lake (FaNq 5)	4180 ± 90	S-403	Dyck (1970)
Amisk (FbNp 17)	4095 ± 195	S-2536	Amundson (1986)
Amisk (FbNp 17)	4200 ± 190	S-2535	Amundson (1986)
Amisk (FbNp 17)	4358 ± 45	NZA-15748	Leyden (2004)
Harder (FbNs 1)	3440 ± 120	S-490	Dyck (1970)
Harder (FbNs 1)	3505 ± 105	S-668	Dyck (1970)
Harder (FbNs 1)	3570 ± 140	S-3453	Dyck (1970)
Harder (FbNs 1)	4335 ± 90	S-3452	Dyck (1970)
Harder (FbNs 1)	4515 ± 150	S-3444	Dyck (1970)
Harder (FbNs 1)	4221 ± 45	NZA-15776	Leyden (2004)
St. Brieux (FdNf 2)	5110 ± 91	S-520	Walker (1981)
St. Louis (FfNk 7)	4590 ± 60	Beta-173608	Amundson et al. (2005)
Below Forks (FhNg 25)	4750 ± 90	TO-10196	Meyer (2003)
Below Forks (FhNg 25)	4790 ± 70	TO-10085	Meyer (2003)

The Oxbow occupation in of the FALC Provincial Forest also corresponds with the end of the Altithermal and the beginning of cooling temperatures, resulting in a transition toward Parkland-Boreal vegetation. It is also during this period that the sand hills begin to stabilize by approximately 4,800 rcybp (Wolfe et al. 2005).

The light Oxbow presence in the FALC Provincial Forest is followed by a more intense McKean Series occupation. McKean occupations have the highest frequency in the Star-Orion South Diamond Project area, with 10 diagnostic projectile points found at six sites (FhNe 11, 86, 88, 90, 111, and 115). The high frequency of McKean occupations is comparable to the Nipawin Reservoir survey where 15 sites were identified (Burley et al. 1982) and the Forks survey where 31 McKean sites were recorded (Wilson 1982).

The McKean Series dates from approximately ca. 4,400 to 3,200 rcybp (Webster 2009). Although the co-existence of this group with Oxbow is debated (Green 1998), this later archaeological manifestation is represented by two distinct point types: the McKean lanceolate and a stemmed variant known as Duncan-Hanna. Radiocarbon dates from sites in Saskatchewan indicate that there may be a slight temporal

separation between these point types, with the lanceolate form dating from approximately 4,400 to 3,400 rcybp and Duncan-Hanna points dating from 3,900 to 3,200 rcybp (Webster 2009).

Radiocarbon dates from McKean sites located in central Saskatchewan are provided in Table 37 and conform to the suggested temporal span. The Crown site, located approximately 50 km downstream from the project area, produced two dates. One related to a lower lanceolate occupation (4075+/-80), and the second related to an upper occupation containing Duncan-Hanna points (3690+/-105). Only one McKean lanceolate point was recovered from the Star-Orion South Diamond Project area (FhNe 115), while the remaining point types were of the Duncan-Hanna variety, suggesting a slightly later occupation of the area by people producing these points.

Table 37: Selected McKean Radiocarbon Dates

Site	Normalized Age (rcybp)	Lab No.	Reference
Graham (FaNq 30)	3245 ± 50	S-1574	Walker (1984)
Thundercloud (FbNp 25)	4145 ± 90	S-3645	Webster (1999)
Thundercloud (FbNp 25)	3172 ± 50	BGS-2369	Webster (2009)
Thundercloud (FbNp 25)	3382 ± 55 (AMS)	NZA-15749	Leyden (2004)
Thundercloud (FbNp 25)	3375 ± 50	BGS-2367	Webster (2009)
Red Tail (FbNp 10)	3580 ± 80	S-3372	Ramsay (1993)
Red Tail (FbNp 10)	3570 ± 80	S-3373	Ramsay (1993)
Red Tail (FbNp 10)	3740 ± 80	S-3008	Ramsay (1993)
Red Tail (FbNp 10)	3980 ± 70	S-3375	Ramsey (1993)
Red Tail (FbNp 10)	3965 ± 70	S-3374	Ramsay (1993)
Cut Arm (FbNp 22)	3520 ± 60	BGS-2384	Webster (2004)
Cut Arm (FbNp 22)	3441 ± 50	BGS-2383	Webster (2004)
Crown (FhNa 86)	3690 ± 105	S-2524	Quigg (1986)
Crown (FhNa 86)	4075 ± 80	S-2526	Quigg (1986)

The final archaeological component of the Middle Precontact Period is the Pelican Lake Phase. Five sites from the Pelican Lake Phase have been recorded in the FALC Provincial Forest (FhNe 82b, 87, 88, and 129 and FhNf 59). Pelican Lake occupations are well known along the Saskatchewan River system, with 27 sites identified during the Forks survey (Wilson 1982), and nine during the Nipawin Reservoir survey (Burley et al. 1982). Three of the latter included buried components at the Gravel Pit site (FhNa 61), the Trail's Edge site (FhNa 107), and the Broken Axle site (FhNc 81).

The Pelican Lake Phase dates from approximately 3,300 to 1,850 rcybp on the Northern Plains (Dyck 1983; Walker 1999). Although there are only a few radiocarbon dates from central Saskatchewan (Table 38), they indicate that people producing Pelican Lake points were occupying the region by at least 3,000 rcybp.

Table 38: Selected Pelican Lake Radiocarbon Dates

Site	Normalized Age (rcybp)	Lab No.	Reference
Thundercloud (FbNp 25)	2570 ± 40	BGS-2370	Webster (1999)
Newo Asiniak (FbNp 16)	3025 ± 215	S-2764	Morlan (1993)
Cline (ElNo 3b)	3005 ± 110	S-2264	Morlan (1993)

4.1.3 The Late Precontact/Woodland Period

The Late Precontact/Woodland Period coincides with the expansion of the southern edge of the boreal forest to its modern position and developments in technology and population growth in the Eastern Woodlands. While Northern Plains cultures did continue to utilize the southern edge of the boreal forest on an intermittent basis over the last 2,000 years (Meyer and Epp 1990), the archaeological remains of the region are mainly characteristic of boreal forest adapted peoples. This period is less well represented in the study area with only five Late Period sites identified.

One Besant projectile point was reported from the initial excavations at FhNe 88 (Western Heritage 2006). Besant sites and artifacts are commonly found across the aspen parkland and into the boreal forest edge (Meyer and Epp 1990). Eleven sites documented during the Forks reconnaissance were identified as Besant (Wilson 1982), while eight were noted in the Nipawin vicinity (Burley et al. 1982). However, it should be noted that a problem exists in that it can be difficult to assign surface finds to the Besant Phase as these points found out of context look remarkably similar to Early Side-notched points. This can result in the misidentification of some Besant sites.

The accepted date range for the Besant Phase is approximately 2,000 to 1,150 rcybp (Dyck 1983; Walker 1999). Radiocarbon dates from Besant sites located in central Saskatchewan are provided in Table 39. The Fitzgerald site represents a single component bison kill site. Hjermstad (1996) suggests that an average of the four dates (1358+/-45 rcybp) he reported provides the best estimate for the age of occupation. A subsequent AMS date obtained by Leyden (2004), however, is in closest agreement with the oldest of the original four dates. If the radiocarbon dates from the Fitzgerald, Grandora, and Tipperary Creek sites are considered the most reliable, this suggests occupation of central Saskatchewan by Besant Phase people by approximately 1,600 rcybp.

The Besant Phase is followed on the Plains by the Avonlea Horizon. The general time period for this horizon is considered to be 1,800 to 1,150 rcybp (Dyck 1983; Walker 1999). One Avonlea projectile point was recovered as a surface find in the Star-Orion South Diamond Project area from FhNe 145 (Golder 2009b). Although not as common, Avonlea components are known along the Saskatchewan River. Three sites were identified during the Nipawin Reservoir heritage study including the Gravel Pit site (FhNa 61), Wallington Flat site (FhNa 112), and Mineral Creek site (FhNc 53) (Meyer and Walde 2009). Three sites with Avonlea points were also identified during the Forks survey (Wilson 1982) and one was identified during the James Smith Reserve archaeological survey (Meyer and Klimko 1986).

Table 39: Selected Besant Radiocarbon Dates

Site	Normalized Age (rcybp)	Lab No.	Reference
Fitzgerald (ElNp 8)	1240 ± 170	S-3547	Hjermstad (1996)
Fitzgerald (ElNp 8)	1350 ± 140	S-3546	Hjermstad (1996)
Fitzgerald (ElNp 8)	1420 ± 65	Beta-69004	Hjermstad (1996)
Fitzgerald (ElNp 8)	1570 ± 90	Beta-69005	Hjermstad (1996)
Fitzgerald (ElNp 8)	1563 ± 45	NZA-15750	Leyden (2004)
Rocky Island (FaNp 7)	2475 ± 120	S-2437	Dyck (1983)
Grandora (FaNr 2)	1640 ± 65	S-542	Christiansen (1970)
Tipperary Creek (FbNp 1)	1615 ± 80	S-2885	Walker et al. (1986)
Newo Asiniak (FbNp 16)	2315 ± 75	S-2530	Kelly (1986)
Newo Asiniak (FbNp 16)	3105 ± 250*	S-2764	Kelly (1986)

* Indicates rejected dates.

Radiocarbon dates from Avonlea sites located in central Saskatchewan are provided in Table 40. The date from Wallington Flat was rejected as being too old, while the Gravel Pit date was initially accepted (Meyer and Klimko 1986). A subsequent thermoluminescence date was obtained from Wallington Flat that returned a date of A.D. 680+/-260 (Meyer and Epp 1990). A thermoluminescence date was also obtained from Avonlea net impressed pottery from the Municipal Camp site also found in the Nipawin area (Meyer and Hamilton 1994). This produced a date of A.D. 710+/-110. These latter dates conform to Avonlea dates found in southern Saskatchewan and are likely more reliable for occupations found in the southern fringes of the boreal forest.

Table 40: Selected Avonlea Radiocarbon Dates

Site	Normalized Age (rcybp)	Lab No.	Reference
Hartley (FaNp 19)	1200 ± 65	S-3382	Clarke (1995)
Tipperary Creek (FbNp 1)	1260 ± 60	Beta-70705	Walker et al. (1986)
Tipperary Creek (FbNp 1)	1315 ± 80	S-2815	Walker et al. (1986)
Newo Asiniak (FbNp 16)	995 ± 75	S-2533	Kelly (1986)
Wallington Flat (FhNa 112)	2910 ± 90*	S-2458	Finnigan et al. (1983)
Gravel Pit (FhNa 61)	815 ± 135	S-2458	Klimko (1985)

* Indicates rejected dates.

Following the Avonlea Horizon, the final cultural group occupying the FALC Provincial Forest is less certain. Five Late Side-notched points and one triangular point were recovered from three sites in the FALC Provincial Forest (FhNe 27, 34, and 88). Unlike the distinctly square based points that typify the Mortlach Phase and are sometimes found in Selkirk Complex sites, these thin, flake points are non-descript side-notched points similar to Middle and Late Woodland points, as well as Prairie Side-notched varieties of the Old Women's Phase. Unfortunately these non-descript points are difficult to classify without proper context or associated artifacts. It is for this reason that Woodland groups are defined archaeologically based largely on pottery technology and style. Although Meyer and Epp (1990) have argued for a limited occupation of the southern boreal forest fringe by the Old Women's Phase, Young (2006) has more recently suggested that there is little evidence to support this.

It is more likely, therefore, that these points reflect a Late Woodland occupation. However, further complicating the issue is that no pottery was associated with these points or identified elsewhere in the project area.

The complete absence of pottery from the FALC Provincial Forest is perhaps the most striking difference with other studies in the region. During the Nipawin Reservoir survey, 11 Late Woodland sites containing Selkirk pottery were identified (Meyer and Russell 2004). The Selkirk Composite dates from approximately 650 to 200 rcybp in Saskatchewan. These sites were found on both the river valley crest and terraces along the valley bottom of the Saskatchewan River. This included five large campsites in the Nipawin area: Bushfield West (FhNa 10), Bushfield East (FhNa 13), Lloyd (FhNa 35), Municipal Camp (FhNc 113), and Mollberg (FhNa 1). Six smaller sites were identified upstream from Nipawin through to Thompson Island. It has been noted that many large Selkirk Composite sites were located at major fisheries and contain great amounts of pottery (Meyer 1993).

West of the Star-Orion South Diamond Project area, one Selkirk site (FgNe 11) was identified during the James Smith Reserve archaeological survey and four Selkirk sites were identified during the Forks survey (Meyer and Russell 2004).

By the Woodland Period, the study area would have resembled what it looks like today, with the southern boreal forest firmly established. Late Woodland groups were uniquely adapted to this forest environment. Discussed in Section 3, this included utilization of diverse forest food resources. The annual round was based on intercepting seasonal concentrations of certain resources such as fish, migratory waterfowl, and berries. Other adaptations related to transportation and movement within the landscape. Overland travel in the thickly vegetated forest is difficult and these groups recognized the utility of following waterways as easily navigable pathways. In fact, most Late Woodland sites in the boreal forest have been identified along the margins of waterways. Occupation of the forest led to innovations in transportation such as birch bark canoes, toboggans, and snowshoes to traverse the region in summer and winter. While these items do not readily preserve in the archaeological record, the wood working tools (i.e., adzes, celts, and wedges) used to manufacture them have (Meyer 1993). It is interesting to note that throughout all the archaeological investigations in the FALC Provincial Forest, only one woodworking tool has been recovered. This included one potential wedge from FhNe 121 (Golder 2009b).

It appears therefore, that during the Late Woodland Period the FALC Provincial Forest was not utilized as intensively as the Saskatchewan River. The absence of pottery indicates that larger campsites and gatherings of Selkirk people such as those found along the Saskatchewan River were not occurring further inland in the FALC Provincial Forest. These groups, with a diverse subsistence and utilization of navigable waterways for transportation were focusing on other regions for resource exploitation. If the Late Side-notched projectile points relate to the Woodland Period, they likely represent small hunting parties travelling up the ravines from the Saskatchewan River. However, it should be noted that if the archaeology surveys of the ravines conducted in the study area were carried out through to their confluence with the Saskatchewan River, it is likely that Late Woodland sites would be encountered at the mouths of these creeks.

In summary, the culture history of the FALC Provincial Forest is generally comparable with other studies carried out in the region. All Precontact periods of occupation are represented, with evidence for occupation beginning as early as 9,000 rcybp. The FALC Provincial Forest is most intensively occupied during the Middle Precontact period with 14/18 sites containing diagnostic points represented by Early Side-notched (n=4), Oxbow (n=1), McKean (n=6), and Pelican Lake (n=4) occupations. The limited Oxbow presence is perhaps surprising giving its ubiquity elsewhere on the Saskatchewan River. The increased occupation during the Middle Period may relate to a more open parkland/plains environment that would have supported larger bison populations and a plains oriented subsistence.

The complete lack of pottery representing Woodland occupations is the most noticeable difference with previous studies in the region. Although the Late Side-notched points may represent Woodland groups, less intensive occupation of the study area during this period may be reflective of the final shift to a forested environment and a corresponding shift to a more diverse woodland subsistence that included a greater emphasis on fish and navigation along waterways.

4.2 Lithic Analysis

As demonstrated in Section 5, the most common artifact recovered from sites in the Star-Orion South Diamond Project area is lithic debitage or waste flakes from stone tool production. Debitage accounts for almost 93% of all artifacts recovered from sites excavated during the mitigation program, and perhaps gives the greatest insight into activities carried out by Precontact groups in the FALC Provincial Forest. A summary of lithic materials is, therefore, provided below.

Lithic Material

Sources of lithic material were almost exclusively local to the study area. SRC dominates assemblages and comprises 94% of all lithic materials, followed distantly by generic chert (1.8%), Gronlid siltstone (1.5%), quartz (1%), and quartzite (0.6%) (Table 41). Given the prevalence of SRC, a further discussion of this lithic material is provided below.

Table 41: Summary of Lithic Materials from Project Area

Material	Frequency	Percentage
Swan River Chert	50,682	94.1
Chert	945	1.8
Gronlid Siltstone	787	1.5
Quartz	549	1
Quartzite	323	0.6
Chalcedony	171	0.3
Red/Yellow Silicified Sediment	108	0.2
Shale	84	0.2
Indeterminate	76	0.1
Sandstone	43	0.1
Mudstone	16	-
Silicified Sediment	14	-
Knife River Flint	11	-
Siltstone	4	-
Silicified Peat	2	-
Red River Chert	2	-
Total	**53,817**	**99.9**

SRC has a bedrock source located southwest of the Dawson's Bay area of Lake Winnipegosis in west-central Manitoba (Grasbey et al. 2002). SRC formed in solution Chimneys in Devonian and Silurian fossiliferous limestone and dolomites, whereby calcium carbonate was replaced with silica. During the last glaciation, material from the solution chimneys were removed and re-deposited in glacial tills. As a result, SRC has a broad distribution throughout central and southern Saskatchewan, western Manitoba, as well as southeastern Alberta, northern Montana, and North Dakota. This material would have been readily accessible to Precontact peoples in exposed glacial tills found throughout this region.

In the stabilized sand dune environment of the FALC Provincial Forest, glacial tills or cobbles of any sort suitable for lithic reduction do not naturally occur. Rather, the nearest source for SRC occurs as exposed cobbles found in the Saskatchewan River valley. This indicates that large amounts of SRC was being procured and transported sometimes significant distances further inland to be reduced into tools. With no suitable materials immediately available, this transportation of raw lithic materials may have been the only option for people travelling through or occupying the study area.

SRC as a material is highly variable in texture, ranging from course with many irregularities (most commonly vugs or cavities lined with small quartz crystals), to fine textured and homogenous with few irregularities (Grasbey et al. 2002). It occurs in a wide range of colours from white and grey to orange, pink, red, and purple. The brighter colours and waxy lustre of this material found in archaeological contexts are attributed to heat-

treatment by Precontact peoples to improve the flaking quality of the stone, which is normally difficult to work (Low 1996).

The remaining local materials were also likely procured from the Saskatchewan River valley and include generic cherts, quartzite, quartz, and Gronlid siltstone. The latter material is distinct and occurs in regional shale beds exposed by the Saskatchewan River and is found southwest of the Nipawin region and throughout east-central Saskatchewan (Johnson 1986). This material occurs as flat nodules with heavily patinated cortexes, and the colour ranges from black to light gray.

A distinct mottled red and yellow silicified sediment that is similar in colour and texture to what has been identified as Tongue River Silica was recovered from two sites in the study area. FhNe 11 produced 52 debitage and FhNe 115 produced 56 debitage representing all stages of reduction. Tongue River Silica has quarry sources located in west-central Minnesota, north-central Iowa, North Dakota, and South Dakota but has no known sources in Canada (Bakken 1993). This material is a silicified sediment that often contains hollow, fossil root molds. It occurs in two varieties based on colour including grey and a mottled red/yellow, and has a course texture with a fine grain sparkle (Bakken 1993). The material is generally of poor quality and is not found far from where it naturally occurs. It was not traded widely during Precontact times.

Similar material has been observed by the authors at two other sites in Saskatchewan over a broad geographic area. It occurs in the form of a Late Side-notched point from EeOc 18 located on the South Saskatchewan River near Shackelton, Saskatchewan (Golder 2008e) and debitage from GeNe 19 located south of Wappawekka Lake in the boreal forest of northern Saskatchewan (Golder 2006c). Given the generally poor quality of the material, it does not seem likely that it would have been traded extensively throughout Saskatchewan. Further, the full range of debitage found at the two sites in the FALC study area indicates that all stages of reduction were occurring. This suggests that nodules or blanks were being reduced rather than the rejuvenation of imported tools. It is likely that this material represents a locally available silicified sediment that occurs throughout Saskatchewan.

Non-local or exotic lithic material occurs in very minor frequencies and includes Knife River Flint. Knife River Flint is a brown chalcedony that has a primary bedrock source found in west-central North Dakota (Ahler 1986). This material was quarried and traded widely throughout the Northern Plains during Precontact times because of its fine texture and superior flaking characteristics. A total of 10 debitage of Knife River Flint were recovered from five sites in the study area (FhNe 11, 49, 82, 98, and 135), with one end scraper recovered from FhNe 82. The minor frequency of this material suggests that limited amounts were obtained via direct or indirect trade networks with southern groups that had access to the material. The minor amount of debitage suggests that rejuvenation of imported tools was occurring rather than tool production from a core or blank.

Debitage Analysis

Before discussing debitage analysis, a comment should be made regarding the classifiable debitage recovered from assemblages in the project area. On average, only 34% (R=22% to 52%) of debitage from assemblages were complete and could be classified to a specific flake type representing a lithic reduction stage. This may appear to be a low frequency; however, it is comparable to the Below Forks site (FhNg 25), which is located approximately 25 km upstream from the study area. This multi-component site contained an Early Side-notched occupation where the collection and reduction of SRC cobbles was a primary activity (Kasstan 2004). Kasstan's (2004) study at this site represents the only detailed debitage analysis in the region. An examination of the

assemblage from FhNg 25 indicated that only 20% of flakes were complete. The high incidence of broken flakes was attributed to a combination of processes including:

- the nature of SRC: the material is difficult to work and often has flaws such as vugs;
- thermal alteration: increases brittleness of the material and thus increased breakage;
- taphonomic processes such as trampling of the living floor and natural freeze/thaw cycles;
- improper techniques employed during lithic reduction; and
- excavation bias: at the Below Forks sites some of the hard river sediments were pounded through a screen with a rubber mallet (Kasstan 2004).

Although the latter does not apply to the sandy environment of the FALC Provincial Forest, the former processes may have been a factor in the high incidence of broken flakes in the project area. Regardless, flake fragments were not classified to a reduction stage and are not considered in the discussions below.

Magne (1985) has suggested that the ratio of recognized stages of lithic debitage present in assemblages can characterize three general types of lithic reduction sites: early/core reduction; middle/wide ranging reduction; and late/maintenance reduction. Core reduction sites have early stage flakes most abundant followed by middle and late stages respectively. The main activity at these sites is the collection of raw material and initial flake blank production. Wide ranging reduction sites have early, middle, and late stage debitage in even proportions. The complete manufacture sequence of tools is present at these sites. Maintenance sites have generally few flakes, but middle and late flakes occur in higher frequencies. Activities at these sites are associated with re-sharpening and reworking of imported tools rather than tool production.

A comparison of debitage by reduction stage at sites where over 1,000 pieces of debitage were recovered in the study area indicates that most sites conform to a wide ranging reduction strategy. Early, middle, and late stage flakes are represented in comparable ratios, with a slightly higher frequency of middle stage flakes (Tables 42 and 43).

Table 42: Debitage Reduction Stages Represented at Select Sites by Frequency

Borden No.	Early: Reduction Flake	Middle: Shaping Flake	Middle: Thinning Flake	Late: Finishing Flake	Late: Bifacial Reduction	Flake Fragment	Shatter	SRC Cobble	Core Fragment	Total
FhNe 11	1,315	1,548	1,296	1,379	19	9,491	10,015		36	25,099
FhNe 49	37	42	48	6		526	466		2	1,127
FhNe 74	364	392	260	367	14	965	808			3,170
FhNe 88	749	687	425	709	22	2,923	2,328	3	12	7,858
FhNe 98	446	320	203	403	13	960	797	1	7	3,150
FhNe 102	68	53	55	35		635	521		1	1,368
FhNe 115	348	444	524	780	15	1,222	668		2	4,003
FhNe 135	287	282	267	530	12	901	999		4	3,282

Borden No.	Early: Reduction Flake	Middle: Shaping Flake	Middle: Thinning Flake	Late: Finishing Flake	Late: Bifacial Reduction	Flake Fragment	Shatter	SRC Cobble	Core Fragment	Total
FhNe 138	94	113	92	87	4	413	390	1	14	1,213
FhNe 143	168	181	171	408	1	176	270			1,375

Table 43: Debitage Reduction Stages Represented at Select Sites by Percentage

Borden No.	Early Stage	Middle Stage	Late Stage	Indet. Flake Fragment	Shatter	Core Fragment	SRC Cobble	Total
FhNe 11	5.2	11.3	5.6	37.8	39.9	0.1	0.0	100
FhNe 49	3.3	8.0	0.5	46.7	41.3	0.0	0.2	100
FhNe 74	11.5	20.6	12.0	30.4	25.5	0.0	0.0	100
FhNe 88	9.5	14.2	9.3	37.2	29.6	0.2	0.0	100
FhNe 98	14.2	16.6	13.2	30.5	25.3	0.2	0.0	100
FhNe 102	5.0	7.9	2.6	46.4	38.1	0.0	0.1	100
FhNe 115	8.7	24.2	19.9	30.5	16.7	0.0	0.0	100
FhNe 135	8.7	16.7	16.5	27.5	30.4	0.0	0.1	100
FhNe 138	7.7	16.9	7.5	34.0	32.2	1.2	0.0	100
FhNe 143	12.2	25.6	29.7	12.8	19.6	0.0	0.0	100

This indicates that the full sequence of tool production was being carried out at these sites. The only exceptions were FhNe 135 and FhNe 143 where there were slightly higher frequencies of late stage flakes. This may indicate more tool finishing or maintenance was occurring at these localities. Generally speaking, the ratios from most sites in the FALC Provincial Forest are comparable to the Below Forks site, where a wide ranging reduction strategy was also recognized in all five occupation levels (Kasstan 2004).

The low frequency of early stage reduction flakes, and the fact that only four raw cobbles were recovered from all sites in the study area, indicates that none of the sites served as a primary core reduction area. This further supports the idea that not only was the Saskatchewan River valley the source for SRC, but Precontact people were likely reducing the raw cobbles into smaller blanks for easier transport inland. These blanks were then further reduced into tools at various short term campsites found along the ravines of the FALC Provincial Forest. Given the relatively few number of tools recovered from the sites, it appears that once the tools were produced they were taken away from the site for use elsewhere.

4.3 Faunal Analysis/Subsistence

In contrast to lithic materials, very few faunal remains were recovered from the Star-Orion South Diamond Project area. Faunal remains were recovered from 12 sites during mitigation, and account for only 3.5% of all artifacts (Table 44). The paucity of bone can be attributed, in part, to poor preservation of organic material in boreal forest environments. The bone was recovered primarily from three sites FhNe 11 (n=861), FhNe 82 (n=663), and FhNe 88 (n=233), the vast majority of which consisted of unidentifiable burned and calcined fragments.

Table 44: Summary of Faunal from Excavated Sites by Frequency

Borden No.	Ident. Bone	Enamel Fragments (large ungulate)	Unid. Bone	Unid. Burned/Calcined	Total	Weight (g)	% of Site Assemblage
FhNe 11	2*	35	82	861	980	328.5	3.7
FhNe 14			1		1	12.8	0.6
FhNe 49		52		11	63	14.9	5.3
FhNe 74				1	1	1	0.03
FhNe 77			6		6	0.4	4.6
FhNe 82		1	1	663	665	196.3	34.9
FhNe 88		2	9	233	244	65.2	2.7
FhNe 91				1	1	0.04	1
FhNe 98			2	11	13	3.4	0.4
FhNe 115		3		10	13	2.8	0.3
FhNe 135				1	1	0.2	0.03
FhNe 138	1**		66	27	94	140.2	4.2
Total	**3**	**93**	**167**	**1819**	**2082**	**765.74**	

* Left astragalus (bison, and possible bison); ** Vertebra (large ungulate).

Only two identifiable bone elements were recovered from the study area. This included the fragment of one left astragalus from FhNe 11, and one indeterminate vertebral fragment from FhNe 138. All elements are from large ungulates and appear to be bison. Tooth enamel fragments from large ungulates were also recovered from five sites.

Although only limited information can be gleaned from the faunal data, some comments can be made. The highly fragmented and burned nature of the assemblages indicates that crushing and boiling of bone for grease rendering was occurring on a limited scale at sites such as FhNe 11, 82, and 88. The few identifiable bone elements suggest that bison were the primary game hunted and processed at FhNe 11 (Duncan/Hanna occupation) and FhNe 138 (unknown occupation). This would certainly be possible during the Middle Precontact Period where the study area would have been a plains/parkland environment suitable for bison.

At the Crown site located approximately 50 km downstream from the study area, and mitigated during the Nipawin Reservoir heritage study, the McKean and Hanna occupations indicate a diverse subsistence base where bison was the main food source, supplemented by large ungulates such as moose and elk, smaller mammals such as rabbits, and also birds and fish (Quigg 1986).

The Middle Woodland occupation (River House) at the Crown site had limited faunal remains, but included bison and moose remains, small mammals including snowshoe hare and beaver, as well as grouse and fish. A similar diverse faunal assemblage was observed at the Below Forks site located 25 km upstream, and the St. Louis site located on the South Saskatchewan River approximately 70 km southwest of the study area. Early Side-notched and Oxbow occupations at these sites indicate a subsistence based primarily on bison that was also heavily supplemented by smaller mammals such as snowshoe hare, canid, and beaver (Johnston 2005). Generally speaking, subsistence along the Saskatchewan River valley during the Middle and Late Periods appears to be diverse, and the same pattern could be expected in the Star-Orion South Diamond Project area. It should be noted, however, that although poor preservation was likely a factor in the limited faunal recoveries,

the dominance of debitage and corresponding dearth of faunal remains and features also seems to suggest that procurement and processing of game was not the focus of activities at sites found in the study area, although they undoubtedly occurred.

At bison processing sites or longer term camp sites, one would expect to find more evidence of features, such as hearths or boiling pits, related to food processing and cooking activities. At the Crown site where 92 m^2 were excavated, the McKean occupations produced 4,273 debitage, 5,024 faunal remains, and three hearth features; the Hanna occupation produced 6,063 debitage, 13,245 faunal remains, one hearth feature, and one FCR cluster (Quigg 1986).

Conversely, although there was a general correspondence in distribution between FCR and burned/calcined bone where they co-occur at sites in the project area, there was no oxidized or dark soil staining to indicate the location of specific features. It is possible that the features were too ephemeral to be obvious while excavating, although other changes in soil colour from root burns and rodent activity were easily recognizable. At FhNe 88 there were two areas of FCR concentration, one in Block A and another in Block D. This may represent the dumping of FCR from nearby features.

The only example of a defined feature in the study area occurred at FhNe 120, where a darkly stained hearth/boiling pit containing FCR was clearly visible. However, it is interesting to note that there was a complete absence of bone fragments recovered from this feature and surrounding area. This site also produced the least number of debitage of all sites where Phase II mitigation occurred. The absence of burned and calcined bone suggests that intensive food processing or grease rendering was not a primary activity. The occupation of the site appears to be sparse, as excavation and previous testing along the ravine edge did not identify additional features or activity areas. It is seems likely that this feature relates to other activities un-related to food processing.

On a final note, a brief comment can be made regarding the stabilized sand dune environment of the FALC Provincial Forest and subsistence practices. Large scale bison kill events have been recorded in similar sand dune environments elsewhere in Saskatchewan. The natural undulating topography of these unique environments was used to create traps or pounds to kill large numbers of bison. These sites are usually represented by a thick bone bed, and evidence of a pound structure such as post holes. Examples of such sites include the Melhagen site, a Besant bison pound located in the Aitkow Sand Hills approximately 19 km southeast of Elbow in south-central Saskatchewan; the Fitzgerald site, also a Besant bison pound and processing area located in the Moose Woods Sand Hills approximately 15 km southeast of Saskatoon, (Hjermstad 1996); and the Tschetter site, an Old Women's Phase bison pound found in the Dunfermline Sand Hills, located approximately 16 km northwest of Saskatoon (Linnamae 1988).

The apparent absence of such kill sites in the study area likely relates to its position within the southern fringes of the boreal forest during the Late Precontact Period. The treed environment would have resulted in a limited bison population and also made the use of such plains oriented strategies problematic. The presence of large scale kill events in the adjacent parklands and plains further suggests that plains oriented peoples were successfully adapted to this environment with little need or desire to venture in to the boreal forest environs of the FALC Provincial Forest.

4.4 Landscape Utilization

Previous studies in areas adjacent to the FALC Provincial Forest, such as the Nipawin Reservoir study and Forks survey, were focussed on portions of the North and South Saskatchewan Rivers as well as the Saskatchewan River proper to be inundated by proposed hydro-electric dams. As a result, the river valley was the focus of assessment and included three general subzones of the valley complex: 1) valley summit, which included the very edge of the valley crest; 2) valley slope, which included terraces within the valley; and 3) valley bottom, which included river flats immediately adjacent to the river. As previously discussed, the results of these studies indicate a regular and intensive occupation of the river valley beginning in the Early Precontact Period, and continuing through the Middle, and Late Precontact Periods. This includes large and prolific campsites with a diversity of artifact classes from the Middle Precontact and Late Woodland Periods.

In contrast to these studies, the Star-Orion South Diamond Project provided an opportunity to examine areas outside the valley complex, north of the Saskatchewan River. As a result of assessment programs conducted since 2004 in the study area, some generalizations can be made. It is apparent that the vast majority of recorded sites occur along the valley crest of ravines that drain into the Saskatchewan River. Although there was a bias toward examining ravines during earlier HRIAs (Golder 2006a), an assessment of large tracts of land between ravines was subsequently carried out. This included proposed Project components such as the Overburden Storage Area (2,247 ha), Orion South Open Pit (378 ha) and the Processed Kimberlite Containment Facility (494 ha) (Golder 2009a to 2009b). Only 14 of 44 sites (32%) identified in these areas were located inland and away from ravine features (FhNe 10, 12, 26, 27, 83, 92, 131, 138, 139, 159, 160, 161, and 164 and FhNf 62 and 64). It should be observed, however, that one of the most prolific heritage resources in the study area, FhNe 11, was not located on a ravine edge. The significance of this site appears to be related to its position on a prominent hill that provides an excellent view of the surrounding landscape. Regardless of their location, the sites found throughout the study area are fairly homogeneous in content and structure, and seem to be focussed on lithic reduction.

The dominance of occupations along ravines in the FALC Provincial Forest is likely attributable to a number of factors. The ravines would have provided access to a diversity of resources including water, game animals, and plants used for food and materials. Perhaps more significantly, however, the ravines would have served as a natural travel route or path leading to and from the even more resource rich Saskatchewan River. It is likely that if assessments along the ravines within the Star-Orion South Diamond Project area continued to their confluence with the Saskatchewan River, significant stratified sites would be found at the mouths of the creeks.

The significance of the Saskatchewan River for large scale camp and aggregation sites has been discussed elsewhere (Meyer and Thistle 1995). The FALC area in particular was the location of a known aggregating centre called Pehonan, which means “the waiting place”, and was part of the landscape utilized by the historically recognized Pegogamaw Cree (Meyer and Thistle 1995; Meyer and Russell 2004). Networks of trails led to resource areas and spiritual places surrounding these aggregating centres (Meyer and Russell 2004). Aggregating centres such as this have produced artifacts representing human occupation dating back several millennia and are, thus, of considerable antiquity (Meyer and Thistle 1995).

It is worthy of note that many of the trading posts along the Saskatchewan River were established at important aggregating centres, such as Opaskweyaw, Paskwatinow, Nipawiwinihk, and Pehonan (Meyer and Thistle 1995). Therefore it is no coincidence that some of the earliest fur trade posts in Saskatchewan such as

Fort St. Louis I (1753-1757) and FALC I (1850-1885), were located a short distance upstream from the project area on what is now the James Smith Reserve (Russell and Meyer 1999).

The sites recorded within the Star-Orion South Diamond Project area, therefore, may represent groups that travelled to and from the resource rich Saskatchewan River valley (and perhaps to aggregation centres) where, amongst other activities, they exploited SRC river cobbles. While venturing inland along the ravine systems, they made stops likely ranging from a few hours, to camps lasting several days, where they engaged in lithic reduction of recently procured SRC. This practice seemed to occur over millennia and resulted in an almost continuous occupation along some drainage valleys such as the East Ravine. Sites such as FhNe 88 reflect the re-occupation of some localities over thousands of years. It is not known if all ravines that drain into the Saskatchewan River exhibit a similar pattern of occupation, or if this is a unique feature to the FALC area. Future studies elsewhere in the region may shed further light on this.

5.0 SUMMARY

As a result of the 2008 and 2010 mitigation program, 28 sites were excavated, including the excavation of 411.25 m^2 and the recovery of 60,274 artifacts. Results from the mitigation and previous assessments in the FALC Provincial Forest indicate occupation of the study area from the Palaeo-Indian Period through to the Late Precontact/Woodland Period. People were occupying the study area soon after the glaciers retreated by approximately 9,000 rcybp, as evidenced by the recovery of one Cody knife (Golder 2006a). However, the most intense occupation occurred during the Middle Precontact Period (ca. 7,500 to 2,000 rcybp). The beginning of this period coincided with a warming trend where the FALC Provincial Forest would have been in a more open parkland/prairie environment with active sand dunes. Eventually as the temperatures began to cool, the vegetation began to transition towards a more parkland/boreal environment that resulted in a stabilization of the sand dunes before the end of this period. By the beginning of the Late Precontact/Woodland Period (2,000 to 200 rcybp), with continuing cooling temperatures, the southern mixed-wood boreal forest that we recognize today established itself in the FALC Provincial Forest. While there is evidence for occupation during this period, there appears to be less intensive Woodland occupation than is typical of the Saskatchewan River proper elsewhere in the region.

Excavations at sites within the FALC Provincial Forest indicate that lithic reduction and tool production was the primary activity at these sites. Although there is evidence for food processing at some of the campsites, it is on a limited scale. There is little evidence for extensive hearth or boiling pit features or large amounts of calcined/burnt bone that is typical of larger scale communal hunting/processing activities. This suggests that Precontact peoples were travelling through the study area to the Saskatchewan River to collect raw lithic materials, (primarily SRC), and then transporting it further inland. As people were moving through the FALC Provincial Forest, they were stopping to camp and further reduce the raw material into blanks and tools. These stops may have ranged between a few hours to a few days, and certain locations such as FhNe 88 were repeatedly occupied through the millenia.

6.0 CLOSURE

We trust the above meets your present requirements. If you have any questions or require additional details, please contact the undersigned.

GOLDER ASSOCIATES LTD.

Patrick Young, M.A.
Archaeologist

Grant Clarke, M.A.
Associate, Senior Archaeologist

Brad Novecosky, M.A.
BioScience Division Manager, Archaeologist

PY/BN/GC/ldmg

n:\active\2010\1361\10-1361-0045 shore gold heritage falc\eis summary\10-1361-0045 appendix iii hrim summary\10-1361-0045 appendix iii hrim summary.docx

7.0 REFERENCES

Ahler, S.A.

1986 *The Knife River Flint Quarries: Excavations at Site 32DU508*. State Historical Society of North Dakota, North Dakota Heritage Centre, Bismarck.

Amundson, L.J.

1986 *The Amisk Site: A Multi-Component Campsite in South-Central Saskatchewan*. Masters Thesis, Department of Anthropology and Archaeology, University of Saskatchewan, Saskatoon.

Amundson, L.J., N.P. Friesen, and K.M. Enns-Kavanagh

2005 *Archaeological Investigations at the St. Louis Site FfNk-7: An Early to Mid-Holocene Occupation of the Lower South Saskatchewan River Valley. Permit No. 02-114*. Prepared for Saskatchewan Highways and Transportation.

Bakken, Kent

1993 Lithic Raw Material Resources in Western Minnesota. *The Platform - a publication of the Minnesota knappers guild*. Vol. 5(3):Part III.

Burley, David, David Meyer, Olga Klimko, Dale Russell, James Finnigan, Jean Prentice, and Malcolm Wilson

1982 Regional Overview and Research Considerations. *Nipawin Reservoir Heritage Study Volume 3*, edited by David Burley and David Meyer. Saskatchewan Research Council Publication No. C-805-25-E-82.

Canadian Antique Stoves

2004 *Stove Inventory (Cooking Stoves)*. Website: http://www.canadian-antique-stoves.com/stove-inventory.htm. Accessed January 19, 2006.

Christiansen, E.A.

1970 *Physical Environment of Saskatoon, Canada*. National Research Council, Saskatoon.

Clarke, G.

1995 *The Hartley Site (FaNp 19): Interpreting a Transitional Avonlea/Old Women's Faunal Assemblage*. Unpublished Masters Thesis, Department of Anthropology and Archaeology, University of Saskatchewan, Saskatoon.

Clayton, L., W.B. Bickley, and W.J. Stone

1970 Knife River Flint. *Plains Anthropologist* Volume 15(50):282-290.

Corbeil, Marcel Ronald

1995 *The Archaeology and Taphonomy of the Heron Eden Site, Southwestern Saskatchewan*. Unpublished Masters Thesis, Department of Anthropology and Archaeology, University of Saskatchewan, Saskatoon.

Dyck, Ian

1970 Two Oxbow Settlement Types in Central Saskatchewan. *Na'pao* 2(2):1-29.

1983 Prehistory of Southern Saskatchewan. In *Tracking Ancient Hunters*, edited by H.T. Epp and I. Dyck pp. 63-140. Saskatchewan Archaeological Society, Saskatoon.

Fedirchuk, Gloria J. and Edward J. McCullough
1992 *The Duckett Site*. Fedirchuk McCullough & Associates Ltd., Calgary.

Ferguson, Marci
2009 Environmental Scientist, Golder Associates Ltd. Saskatoon, Saskatchewan. Personal communication.

Finnigan, Jim, David Meyer, and Jean Prentice
1983 *Resource Inventory, Assessment and Evaluation*. Nipawin Reservoir Heritage Study, Volume 5, edited by David Meyer. Saskatchewan Research Council Publication No. E-903-E-83.

Golder Associates Ltd.
2005 *Heritage Resources Impact Assessment: DeBeers Canada Inc. Fort à la Corne Diamond Exploration Program. Permit No. 04-042*. Report on file with Heritage Resources Branch, Regina.

2006a *Heritage Resources Impact Assessment: DeBeers Canada Inc. Fort à la Corne 2005 Diamond Exploration Program. Permit No. 05-038*. Report on file with Heritage Resources Branch, Regina.

2006b *Heritage Resources Impact Assessment: Fort à la Corne Joint Venture Advanced Exploration Program (2006). Permit No. 06-064*. Report on file with Heritage Resources Branch, Regina.

2006c *Heritage Resources Impact Assessment: 2005 Weyerhaeuser Saskatchewan Prince Albert Forest Management Agreement Area. Permit No. 05-066*. Report on file with Heritage Resources Branch, Regina.

2007a *Heritage Resources Impact Assessment: Kensington Resources Ltd. Orion South Bulk Sampling Shaft Project. Permit No. 07-053*. Report on file with Heritage Resources Branch, Regina.

2007b *Heritage Resources Impact Assessment: Shore Gold Inc. Geotechnical Drilling Project. Permit No. 07-245*. Report on file with Heritage Resources Branch, Regina.

2007c *Heritage Resources Impact Assessment: Shore Gold Inc. 2007 Drilling Program. Permit No. 07-259*. Report on file with Heritage Resources Branch, Regina.

2007d *Heritage Resources Impact Assessment: Shore Gold Inc. Proposed Drill Pad Project. Permit No. 07-305*. Report on file with Heritage Resources Branch, Regina.

2007e *Heritage Resources Impact Assessment: East Ravine Survey and Large Diameter Drill Pad Assessment. Permit No. 07-292*. Report on file with Heritage Resources Branch, Regina.

2007f *Heritage Resources Impact Assessment: Shore Gold Inc. Proposed SPF-085 LDD Pad. Permit No. 07-341*. Report on file with Heritage Resources Branch, Regina.

2008a *Heritage Resources Impact Assessment: Kensington Resources Ltd. 2008 LDD Pad Expansions. Permit No. 08-092*. Report on file with Heritage Resources Branch, Regina.

2008b *Heritage Resources Impact Assessment: Kensington Resources Ltd. Orion South Pit. Permit No. 08-093*. Report on file with Heritage Resources Branch, Regina.

Golder Associates Ltd. (continued)

2008c *Heritage Resources Impact Assessment: Kensington Resources Ltd. Orion South to Star Water Pipeline. Permit No. 08-139*. Report on file with Heritage Resources Branch, Regina.

2008d *Heritage Resources Impact Assessment: Shore Gold Inc. Star Body 2008 LDD Pad Expansions. Permit No. 08-175*. Report on file with Heritage Resources Branch, Regina.

2008e Golder *Technical Memo, August 26, 2008. Shore Gold Inc. Phase II Mitigation Recommendation*. Memo on file with Heritage Resources Branch, Regina.

2010a *Heritage Resources Impact Assessment: Shore Gold Inc. Star Diamond Project. Permit No. 08-094.* Report on file with Heritage Resources Branch, Regina.

2010b *Heritage Resources Impact Assessment/Mitigation: Shore Gold Inc. Star-Orion South Diamond Project 2010 Facilities Footprint. Permit No. 10-208.* Report on file with Heritage Resources Branch, Regina.

2010c *Heritage Resources Impact Assessment/Mitigation: Shore Gold Inc. Star-Orion South Diamond Project 2010 Facilities Footprint. Permits No. 10-208 and No. 10-237*. Report on file with Heritage Resources Branch, Regina.

Grasbey, E., E.M. Gryba, and R.K. Bezys

2002 A Bedrock Source of Swan River Chert. *Plains Anthropologist* 47:275-283.

Green, D'Arcy C.

1998 *A Re-Evaluation of the Oxbow Dam site (DhMn-1): Middle Holocene Cultural Continuity on the Northern Plains*. Unpublished Masters Thesis, Department of Archaeology, University of Saskatchewan, Saskatoon.

Hjermstad, Benjamin

1996 *The Fitzgerald Site: A Besant Pound and Processing Area on the Northern Plains.* Unpublished Masters Thesis, Department of Anthropology and Archaeology, University of Saskatchewan, Saskatoon.

Johnson, Eldon

1986 *Properties and Sources of some Saskatchewan Lithic Materials of Archaeological Significance*. Masters Thesis, Department of Anthropology and Archaeology, University of Saskatchewan, Saskatoon.

Johnston, Jenna S.

2005 *The St. Louis Site (FfNk 7) and the Below Forks Site (FhNg 25): The Faunal Analysis of Two Mummy Cave Series and Oxbow Complex Sites in Central Saskatchewan*. Unpublished Masters Thesis, Department of Archaeology, University of Saskatchewan, Saskatoon.

Kasstan, Steven C.

2004 *Lithic Technology at the Below Forks Site, FhNg 25: Strategies of Stone Tool Manufacture*. Unpublished Masters Thesis. University of Saskatchewan, Saskatoon.

Kelly, David

1986 *The Newo Asiniak Site: a Multicomponent Bison Procurement Site in Central Saskatchewan*. Masters Thesis, Department of Anthropology and Archaeology, University of Saskatchewan, Saskatoon.

Klimko, Olga

1985 New Perspectives on Avonlea: A View from the Saskatchewan Forest. In *Contributions to Plains Prehistory*, edited by David Burley, pp. 64-81. Occasional Paper No. 26, Archaeological Survey of Alberta, Edmonton.

Kooyman, Brian

2000 *Understanding Stone Tools and Archaeological Sites*. University of Calgary Press, Calgary.

Leyden, Jeremy

2004 *Palaeoecology of Southern Saskatchewan Bison: Changes in Diet and Environment as Inferred Through the Stable Isotope Analysis of Bone Collagen*. Unpublished Masters Thesis, Department of Archaeology, University of Saskatchewan, Saskatoon.

Linnamae, Urve

1988 The Tschetter Site: A Prehistoric Bison Pound in the Parklands. In *Out of the Past: Sites, Digs and Artifacts in the Saskatoon Area*, edited by Urve Linnamae and Tim E.H. Jones, pp. 91-116. Saskatchewan Archaeological Society, Saskatoon.

Linnamae, Urve and I. Cazakoff

1990 *The Heron Eden Site: An Intact Cody Complex Site in Southwestern Saskatchewan: Interim Report of the 1989 Excavations*. Department of Anthropology and Archaeology, University of Saskatchewan, Saskatoon. Submitted to Heritage Branch, Government of Saskatchewan, Regina.

Low, Bruce D.

1996 Swan River Chert. *Plains Anthropologist* 41:165-174.

Magne, M.P.R.

1985 Lithics and Livilihood: Stone Tool Technologies of Central and Southern Interior British Columbia. *National Museum of Man, Mercury Series No. 133*. Ottawa.

McKeand, Peggy

1995 *A Comprehensive Faunal Analysis of Bushfield West (FhNa-10) Nipawin, Saskatchewan*. Unpublished Masters Thesis, Department of Anthropology and Archaeology, University of Saskatchewan, Saskatoon.

Meyer, David

1985 A Component of the Scottsbluff Tradition: Excavations at the Niska Site. *Canadian Journal of Archaeology* 9:1-35.

1993 People Before Kelsey: An Overview of Cultural Developments. In *Three Hundred Prairie Years: Henry Kelsey's Inland Country of Good Report*, edited by Henry Epp, pp. 54-73. Canadian Plains Research Centre, Regina.

Meyer, David (continued)

2003 *Excavations at the Below Forks Site: The 2002 Season Interim Report*. Manuscript on file with the Heritage Resources Branch, Regina.

Meyer, David and Henry Epp

1990 North-South Interaction in the Late Prehistory of Central Saskatchewan. *Plains Anthropologist* 35(132):321-342.

Meyer, David and Henri Liboiron

1990 A Paleoindian Drill from the Niska Site in Southern Saskatchewan. *Plains Anthropologist* 35(129): 299-302.

Meyer, David and S. Hamilton

1994 Neighbors to the North: Peoples of the Boreal Forest. In *Plains Indians, A.D. 500-1500: The Archaeological Past of Historic Groups*, edited by K.H. Schlesier, pp. 97-127. University of Oklahoma Press, Norman.

Meyer, David and Olga Klimko

1986 *James Smith Reserve Heritage Reconnaissance.* On file with the Community Support Services Branch (Heritage), Regina.

Meyer, David and Dale Russell

2004 So Fine and Pleasant, Beyond Description: The Lands and Lives of the Pegogamaw Crees. *Plains Anthropologist* 49(191):217-252.

Meyer, David and Paul Thistle

1995 Saskatchewan River Rendezvous Centres and Trading Posts: Continuity in a Cree Social Geography. *Ethnohistory* 42(3):403-444.

Meyer, David and Dale Walde

2009 Rethinking Avonlea: Pottery Wares and Cultural Phases. *Plains Anthropologist* 54(209):49-73.

M.G. Bixby and Co.

1886 *Industries of Canada: Historical and Commercial Sketches of Toronto and Environs*. M.G. Bixby and Co., Publishers, Toronto.

Morlan, R.E.

1993 Compilation of Radiocarbon Dates in Saskatchewan. *Saskatchewan Archaeology* 13:3-84.

Quigg, J. Michael

1986 The Crown Site (FhNa-86) Excavation Results. *Nipawin Reservoir Heritage Study, Vol. 8.* Saskatchewan Research Council, Saskatoon.

Ramsay, Charles L.

1993 *The Redtail Site: A McKean Habitation in South Central Saskatchewan*. Masters Thesis, Department of Anthropology and Archaeology, University of Saskatchewan, Saskatoon.

Russell, Dale and David Meyer

1999 The History of the Fur Trade ca. 1682 - post 1821. In *Atlas of Saskatchewan*, edited by Ka-iu Fung, pp. 33-35. University of Saskatchewan, Saskatoon.

Sutton, Mark Q. and Brooke S. Arkush

2006 *Archaeological Laboratory Methods*, Fourth Edition. Kendall/Hunt Publishing Company, USA.

Walker, Ernest G.

1980 *The Gowen Site: An Early Archaic Site on the Northern Plains*. Unpublished Ph.D. dissertation, University of Texas, Austin.

1981 The Greenwater Lake Site (FeMv-1): An Archaic Burial from Saskatchewan. *Na'pao* 11(1&2):8-12.

1984 The Graham Site: A McKean Cremation from Southern Saskatchewan. *Plains Anthropologist* 29:139-150.

1999 Precontact Archaeology of Southern Saskatchewan. In *Atlas of Saskatchewan*, edited by Ka-iu Fung. University of Saskatchewan, Saskatoon.

Walker, E.G., Leslie J. Amundson and David L. Kelly

1986 *Archaeological Investigations at the Wanuskewwin Heritage Park, 1985 Field Season*. Unpublished Interim Report Manuscript.

Webster, Sean Michael

1999 *Interpreting Northern Plains Subsistence Practices: An Analysis of the Faunal and Floral Assemblage from the Thundercloud Site (FbNp-25)*. Unpublished Masters Thesis, Department of Anthropology and Archaeology, University of Saskatchewan, Saskatoon.

2004 *A Re-Evolution of the McKean Series on the Northern Plains*. Unpublished Ph.D. dissertation. Department of Archaeology, University of Saskatchewan, Saskatoon.

2009 A Re-Evaluation of the McKean Series on the Northern Plains. *Occasional Papers in Archaeology Number 1*. Saskatchewan Archaeological Society and Department of Archaeology and Anthropology, University of Saskatchewan, Saskatoon.

Western Heritage Services Inc.

2005 *Heritage Resources Impact Assessment: Star Kimberlite Project 2005-2006 Surface Exploration. Permit No. 05-087*. Report on file with the Heritage Resources Branch, Regina.

2006 *Heritage Resources Impact Assessment of Shore Gold Inc., Star Kimberlite Project 2006 Surface Exploration Program Permit No. 06-103*. Report prepared for Shore Gold Inc.

2007 The Fort à la Corne Forest Area: A survey of Historical Documents. Report prepared for Shore Gold Inc.

Wilson, James S.

1982 Archaeology and History. In *Environmental Baseline Study of the Saskatchewan River, Saskatchewan, in the Vicinity of Choiceland and the 'Forks'*, edited by A.E. Pipe. Saskatchewan Research Council Publication No. C-805-25-E-80.

Wolfe Stephen A., Jeffrey Ollerhead, David J. Huntley, and Olav B. Lian

2005 *Holocene dune activity and environmental change in the prairie parkland and boreal forest, central Saskatchewan, Canada*. Website: http://www.sfu.ca/physics/research/workarea/huntley/109paper.pdf. Accessed December 6, 2005.

Young, Patrick

2006 *An Analysis of Late Woodland Ceramics from Peter Pond Lake, Saskatchewan*. Unpublished Masters Thesis, Department of Anthropology and Archaeology, University of Saskatchewan, Saskatoon.

Zurburg, Suzanne

1991 *The Norby Site: A Mummy Cave Complex Bison Kill on the Northern Plains*. Masters Thesis, Department of Anthropology and Archaeology, University of Saskatchewan, Saskatoon.

APPENDIX A

FhNe 12 Site Sketch Map

APPENDIX B

Artifact Density Plots

APPENDIX C

Tool Metrics

At Golder Associates we strive to be the most respected global group of companies specializing in ground engineering and environmental services. Employee owned since our formation in 1960, we have created a unique culture with pride in ownership, resulting in long-term organizational stability. Golder professionals take the time to build an understanding of client needs and of the specific environments in which they operate. We continue to expand our technical capabilities and have experienced steady growth with employees now operating from offices located throughout Africa, Asia, Australasia, Europe, North America and South America.

Africa	+ 27 11 254 4800
Asia	+ 852 2562 3658
Australasia	+ 61 3 8862 3500
Europe	+ 356 21 42 30 20
North America	+ 1 800 275 3281
South America	+ 55 21 3095 9500

solutions@golder.com
www.golder.com

Golder Associates Ltd.
1721 8th Street East
Saskatoon, Saskatchewan, Canada S7H 0T4
Canada
T: +1 (306) 665 7989

Golder Associates

G:\2010\10-1361\10-1361-0045 Shore Gold Heritage\GIS\Maps\Mitigation Report\10-1361-0045-HERR-HRIM_Location of Heritage Resources Recommended for Phase I Mitigation.mxd - 11/10/2010 @ 9:30:00 AM

505000 506000 507000 508000 509000 510000 511000 512000 513000 514000 515000 516000 517000 518000 519000 520000 521000 522000 523000 524000

5904000 5903000 5902000 5901000 5900000 5899000 5898000 5897000 5896000 5895000 5894000 5893000

FhNf 27 FhNf 44 FhNf 36 FhNf 39 FhNf 34 FhNf 54 FhNf 33 FhNf 31 FhNf 32 FhNf 51 FhNf 52 FhNf 53 FhNf 55 FhNf 35 FhNf 38 FhNf 41 FhNf 37 FhNf 30 FhNf 28 FhNf 29 FhNf 45 FhNf 42 FhNf 43 FhNf 47 FhNf 46 FhNf 48 FhNf 49 FhNf 50 FhNf 62 FhNf 64 FhNf 63 FhNf 59 FhNf 60 FhNf 61 FhNf 58 FhNf 57

FhNe 8 FhNe 9 FhNe 54 FhNe 121 FhNe 55 FhNe 19 FhNe 15 FhNe 100 FhNe 48 FhNe 12 FhNe 92 FhNe 23 FhNe 22 FhNe 58 FhNe 57 FhNe 59 FhNe 10 FhNe 131 FhNe 130 FhNe 60 FhNe 134 FhNe 62 FhNe 63 FhNe 125 FhNe 61 FhNe 126 FhNe 127 FhNe 56 FhNe 7 FhNe 152 FhNe 156 FhNe 157 FhNe 162 FhNe 163 FhNe 64 FhNe 67 FhNe 65 FhNe 66 FhNe 109 FhNe 108 FhNe 110 FhNe 116 FhNe 90 FhNe 120 FhNe 133 FhNe 124 FhNe 99 FhNe 95 FhNe 147 FhNe 135 FhNe 144 FhNe 72 FhNe 70 FhNe 69 FhNe 71 FhNe 98 FhNe 136 FhNe 68 FhNe 145 FhNe 85 FhNe 27 FhNe 117 FhNe 143 FhNe 74 FhNe 45 FhNe 46 FhNe 44 FhNe 77 FhNe 76 FhNe 75 FhNe 80 FhNe 81 FhNe 79 FhNe 62 FhNe 139 FhNe 78 FhNe 138 FhNe 83 FhNe 84 FhNe 82 FhNe 16 FhNe 20 FhNe 28 FhNe 164 FhNe 17 FhNe 18 FhNe 11 FhNe 115 FhNe 155 FhNe 141 FhNe 142 FhNe 14 FhNe 21 FhNe 153 FhNe 47 FhNe 119 FhNe 149 FhNe 148 FhNe 146 FhNe 50 FhNe 53 FhNe 105 FhNe 49 FhNe 104 FhNe 118 FhNe 112 FhNe 91 FhNe 87 FhNe 150 FhNe 93 FhNe 13 FhNe 132 FhNe 137 FhNe 113 FhNe 86 FhNe 89 FhNe 111 FhNe 154 FhNe 114 FhNe 88 FhNe 103 FhNe 102 FhNe 94 FhNe 97 FhNe 96 FhNe 73 FhNe 51 FhNe 151 FhNe 129 FhNe 52 FhNe 128 FhNe 107 FhNe 106 FhNe 53 FhNe 151 FhNe 20 FhNe 28 FhNe 164 FhNe 16 FhNe 83 FhNe 84 FhNe 138 FhNe 78 FhNe 82 FhNe 139 FhNe 62 FhNe 79 FhNe 81 FhNe 80 FhNe 76 FhNe 75 FhNe 77 FhNe 143 FhNe 45 FhNe 46 FhNe 44 FhNe 74 FhNe 85 FhNe 27 FhNe 31 FhNe 32 FhNe 165 FhNe 30 FhNe 25 FhNe 33 FhNe 161 FhNe 159 FhNe 26 FhNe 160 FhNe 34 FhNe 24 FhNe 36 FhNe 42 FhNe 39 FhNe 38 FhNe 40 FhNe 41 FhNe 101 FhNe 102 FhNe 110 FhNe 90 FhNe 120 FhNe 133 FhNe 124 FhNe 99 FhNe 95 FhNe 147 FhNe 135 FhNe 144 FhNe 72 FhNe 70 FhNe 69 FhNe 71 FhNe 98 FhNe 136 FhNe 68 FhNe 145 FhNe 85 FhNe 27 FhNe 117 FhNe 143 FhNe 74 FhNe 45 FhNe 46 FhNe 44 FhNe 77 FhNe 76 FhNe 75 FhNe 80 FhNe 81 FhNe 79 FhNe 62 FhNe 139 FhNe 78 FhNe 138 FhNe 83 FhNe 84 FhNe 82 FhNe 16 FhNe 20 FhNe 28 FhNe 164 FhNe 17 FhNe 18 FhNe 11 FhNe 115 FhNe 155 FhNe 141 FhNe 142 FhNe 14 FhNe 21 FhNe 153 FhNe 47 FhNe 119 FhNe 149 FhNe 148 FhNe 146 FhNe 50 FhNe 53 FhNe 105 FhNe 49 FhNe 104 FhNe 118 FhNe 112 FhNe 91 FhNe 87 FhNe 150 FhNe 93 FhNe 13 FhNe 132 FhNe 137 FhNe 113 FhNe 86 FhNe 89 FhNe 111 FhNe 154 FhNe 114 FhNe 88 FhNe 103 FhNe 102 FhNe 94 FhNe 97 FhNe 96 FhNe 73 FhNe 51 FhNe 151 FhNe 129 FhNe 52 FhNe 128 FhNe 107 FhNe 106 FhNe 53 FhNe 151 FhNe 20 FhNe 28 FhNe 164 FhNe 16 FhNe 83 FhNe 84 FhNe 138 FhNe 78 FhNe 82 FhNe 139 FhNe 62 FhNe 79 FhNe 81 FhNe 80 FhNe 76 FhNe 75 FhNe 77 FhNe 143 FhNe 45 FhNe 46 FhNe 44 FhNe 74 FhNe 85 FhNe 27 FhNe 31 FhNe 32 FhNe 165 FhNe 30 FhNe 25 FhNe 33 FhNe 161 FhNe 159 FhNe 26 FhNe 160 FhNe 34 FhNe 24 FhNe 36 FhNe 42 FhNe 39 FhNe 38 FhNe 40 FhNe 41

Orion South Pit

Runoff Pond

Plant Site

Polishing Pond

Processed Kimberlite Containment Facility

Sewage Lagoon

Coarse Processed Kimberlite Storage

Overburden Storage

Star Orion Pit

Duke Ravine Reservoir

Duke Ravine

FALC Ravine

Wapiti Ravine

English Creek

East Ravine

Saskatchewan River

West Perimeter Ravine

West Ravine

101 Ravine

Twp 49

Rge 20 W2M

Rge 19 W2M

Legend

- Heritage Resource Recommended for Phase I Mitigation
- Heritage Resource
- Shore Facility

Reference:
Heritage Branch, Ministry of Tourism, Culture, Parks and Sport, 2010
Mapsheet 73H/2,7
NAD 83 UTM Zone 13 (Grid North)

1 0 1
SCALE 1:50,000 KILOMETRES

PROJECT
SHORE GOLD INC.

TITLE
LOCATION OF KNOWN HERITAGE RESOURCES RECOMMENDED FOR PHASE I MITIGATION IN STAR-ORION SOUTH DIAMOND PROJECT AREA

Golder Associates
Saskatoon, Saskatchewan

PROJECT		10-1361-0045	FILE No.	
DESIGN			SCALE AS SHOWN	REV. 0
GIS	MGD	20/10/10	FIGURE: 1	
CHECK	PY	08/11/10		
REVIEW	BN	08/11/10		

G:\2010\1361\10-1361-0045 Shore Gold Heritage\GIS\Maps\Mitigation Report\10-1361-0045-HERR-HRIM_Location of Heritage Resources Recommended for Phase II Mitigation.mxd - 11/10/2010 @ 9:31:32 AM

505000 506000 507000 508000 509000 510000 511000 512000 513000 514000 515000 516000 517000 518000 519000 520000 521000 522000 523000 524000

5904000 5903000 5902000 5901000 5900000 5899000 5898000 5897000 5896000 5895000 5894000 5893000

FhNf 27 FhNf 44 FhNf 36 FhNf 39 FhNf 34 FhNf 54 FhNf 33 FhNf 31 FhNf 32 FhNf 51 FhNf 52 FhNf 53 FhNf 55 FhNf 35 FhNf 38 FhNf 41 FhNf 37 FhNf 30 FhNf 28 FhNf 29 FhNf 45 FhNf 42 FhNf 43 FhNf 47 FhNf 46 FhNf 48 FhNf 49 FhNf 50

FhNe 8 FhNe 9 FhNe 54 FhNe 121 FhNe 55 FhNe 19 FhNe 15 FhNe 100 FhNe 48 FhNe 12 FhNe 130 FhNe 92 FhNe 23 FhNe 22 FhNe 58 FhNe 57 FhNe 59 FhNe 10 FhNe 131 FhNe 60 FhNe 134 FhNe 62 FhNe 63 FhNe 125 FhNe 61 FhNe 126 FhNe 127 FhNe 56 FhNe 128 FhNe 52 FhNe 129 FhNe 107 FhNe 51 FhNe 106 FhNe 151 FhNe 53 FhNe 50 FhNe 105 FhNe 146 FhNe 49 FhNe 104 FhNe 112 FhNe 118 FhNe 87 FhNe 150 FhNe 93 FhNe 13 FhNe 137 FhNe 132 FhNe 113 FhNe 86 FhNe 109 FhNe 154 FhNe 89 FhNe 111 FhNe 103 FhNe 88 FhNe 108 FhNe 141 FhNe 142 FhNe 14 FhNe 94 FhNe 102 FhNe 110 FhNe 21 FhNe 97 FhNe 116 FhNe 96 FhNe 90 FhNe 153 FhNe 47 FhNe 120 FhNe 119 FhNe 149 FhNe 148 FhNe 133 FhNe 145 FhNe 124 FhNe 68 FhNe 99 FhNe 95 FhNe 136 FhNe 98 FhNe 144 FhNe 147 FhNe 135 FhNe 72 FhNe 70 FhNe 69 FhNe 71 FhNe 85 FhNe 27 FhNe 31 FhNe 32 FhNe 25 FhNe 33 FhNe 161 FhNe 159 FhNe 26 FhNe 160 FhNe 34 FhNe 24 FhNe 36 FhNe 42 FhNe 39 FhNe 38 FhNe 40 FhNe 41 FhNe 20 FhNe 28 FhNe 164 FhNe 16 FhNe 17 FhNe 115 FhNe 83 FhNe 84 FhNe 138 FhNe 18 FhNe 11 FhNe 78 FhNe 82 FhNe 155 FhNe 139 FhNe 141 FhNe 142 FhNe 79 FhNe 81 FhNe 80 FhNe 76 FhNe 75 FhNe 77 FhNe 143 FhNe 45 FhNe 46 FhNe 44 FhNe 74 FhNe 64 FhNe 63 FhNe 31 FhNe 32 FhNe 165 FhNe 30 FhNe 25 FhNe 33 FhNe 161 FhNe 159 FhNe 160 FhNe 34 FhNe 24 FhNe 36 FhNe 42 FhNe 39 FhNe 38 FhNe 40 FhNe 41

FhNf 58 FhNf 59 FhNf 60 FhNf 61 FhNf 57 FhNf 62

FhNe 7 FhNe 152 FhNe 156 FhNe 157 FhNe 162 FhNe 163 FhNe 64 FhNe 67 FhNe 65 FhNe 66

FhNd 13

Orion South Pit

Runoff Pond

Plant Site

Polishing Pond

Sewage Lagoon

Processed Kimberlite Containment Facility

Coarse Processed Kimberlite Storage

Duke Ravine Reservoir

Overburden Storage

Star Orion Pit

West Perimeter Ravine

West Ravine

101 Ravine

Duke Ravine

FALC Ravine

Wapiti Ravine

English Creek

East Ravine

Saskatchewan River

Twp 49

Rge 20 W2M

Rge 19 W2M

Legend

- Heritage Resource Recommended for Phase II Mitigation
- Heritage Resource
- Shore Facility

Reference:
Heritage Branch, Ministry of Tourism, Culture, Parks and Sport, 2010
Mapsheet 73H/2,7
NAD 83 UTM Zone 13 (Grid North)

1 0 1
SCALE 1:50,000 KILOMETRES

PROJECT
SHORE GOLD INC.

TITLE
LOCATION OF KNOWN HERITAGE RESOURCES RECOMMENDED FOR PHASE II MITIGATION IN STAR-ORION SOUTH DIAMOND PROJECT AREA

Golder Associates
Saskatoon, Saskatchewan

PROJECT		10-1361-0045	FILE No.		
DESIGN			SCALE AS SHOWN	REV.	0
GIS	MGD	20/10/10	FIGURE: 2		
CHECK	PY	08/11/10			
REVIEW	BN	08/11/10			

G:\2010\10361\10-1361-0045 Shore Gold Heritage\GIS\Maps\Mitigation Report\10-1361-0045-HERR-HRIM_Location of Heritage Resources Recommended for Phase III Mitigation.mxd - 11/10/2010 @ 9:33:21 AM

505000 506000 507000 508000 509000 510000 511000 512000 513000 514000 515000 516000 517000 518000 519000 520000 521000 522000 523000 524000

5904000 5903000 5902000 5901000 5900000 5899000 5898000 5897000 5896000 5895000 5894000 5893000

FhNf 27 FhNf 44 FhNf 36 FhNf 39 FhNf 34 FhNf 54 FhNf 33 FhNf 31 FhNf 32 FhNf 51 FhNf 52 FhNf 53 FhNf 55 FhNf 35 FhNf 38 FhNf 41 FhNf 37 FhNf 30 FhNf 28 FhNf 29 FhNf 45 FhNf 42 FhNf 43 FhNf 47 FhNf 46 FhNf 48 FhNf 49 FhNf 50

FhNe 8 FhNe 9 FhNe 54 FhNe 121 FhNe 55 FhNe 19 FhNe 15 FhNe 100 FhNe 48 FhNe 12 FhNe 130 FhNe 92 FhNe 23 FhNe 22 FhNe 58 FhNe 57 FhNe 59 FhNe 10 FhNe 131 FhNe 60 FhNe 134 FhNe 62 FhNe 63 FhNe 125 FhNe 61 FhNe 126 FhNe 127 FhNe 56 FhNe 128 FhNe 52 FhNe 129 FhNe 107 FhNe 51 FhNe 106 FhNe 151 FhNe 53 FhNe 50 FhNe 105 FhNe 146 FhNe 49 FhNe 104 FhNe 115 FhNe 112 FhNe 118 FhNe 94 FhNe 87 FhNe 150 FhNe 93 FhNe 13 FhNe 132 FhNe 137 FhNe 113 FhNe 86 FhNe 109 FhNe 155 FhNe 154 FhNe 89 FhNe 114 FhNe 141 FhNe 88 FhNe 111 FhNe 142 FhNe 103 FhNe 108 FhNe 14 FhNe 94 FhNe 102 FhNe 110 FhNe 21 FhNe 97 FhNe 116 FhNe 96 FhNe 90 FhNe 73 FhNe 153 FhNe 47 FhNe 120 FhNe 117 FhNe 119 FhNe 149 FhNe 133 FhNe 145 FhNe 148 FhNe 124 FhNe 68 FhNe 99 FhNe 85 FhNe 95 FhNe 136 FhNe 69 FhNe 98 FhNe 147 FhNe 71 FhNe 144 FhNe 135 FhNe 72 FhNe 70 FhNe 20 FhNe 28 FhNe 164 FhNe 16 FhNe 17 FhNe 83 FhNe 84 FhNe 115 FhNe 18 FhNe 11 FhNe 138 FhNe 78 FhNe 82 FhNe 139 FhNe 79 FhNe 81 FhNe 80 FhNe 76 FhNe 75 FhNe 77 FhNe 143 FhNe 45 FhNe 46 FhNe 44 FhNe 74 FhNe 31 FhNe 32 FhNe 25 FhNe 33 FhNe 161 FhNe 159 FhNe 34 FhNe 160 FhNe 24 FhNe 36 FhNe 42 FhNe 39 FhNe 38 FhNe 40 FhNe 41 FhNe 27 FhNe 26

FhNf 62 FhNf 64 FhNf 63 FhNe 165 FhNe 30 FhNf 59 FhNf 60 FhNf 61 FhNf 58 FhNf 57

FhNe 7 FhNe 152 FhNe 156 FhNe 157 FhNe 163 FhNe 64 FhNe 67 FhNe 65 FhNe 66 FhNe 162 FhNe 108 FhNe 110 FhNe 116 FhNe 90 FhNe 120 FhNe 133 FhNe 124 FhNe 99 FhNe 95 FhNe 147 FhNe 135 FhNd 13

Orion South Pit

Runoff Pond

Plant Site

Processed Kimberlite Containment Facility

Polishing Pond

Sewage Lagoon

Coarse Processed Kimberlite Storage

Duke Ravine Reservoir

Overburden Storage

Star Orion Pit

West Perimeter Ravine

West Ravine

101 Ravine

Duke Ravine

FALC Ravine

Wapiti Ravine

English Creek

East Ravine

Saskatchewan River

Twp 49

Rge 20 W2M

Rge 19 W2M

Legend

- Heritage Resource Recommended for Phase III Mitigation
- Heritage Resource
- Shore Facility

Reference:
Heritage Branch, Ministry of Tourism, Culture, Parks and Sport, 2010
Mapsheet 73H/2,7
NAD 83 UTM Zone 13 (Grid North)

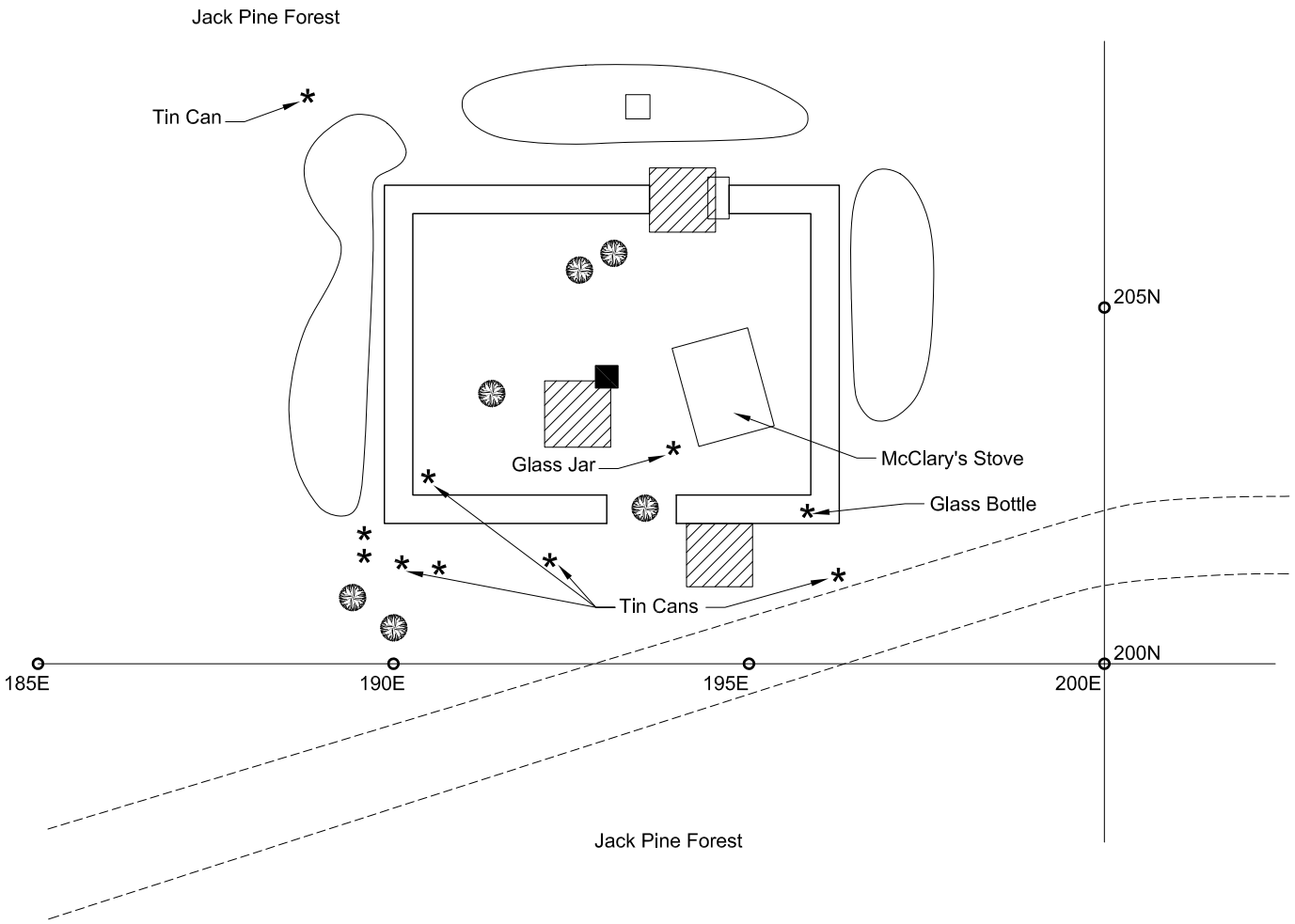
1 0 1
SCALE 1:50,000 KILOMETRES

PROJECT
SHORE GOLD INC.

TITLE
LOCATION OF KNOWN HERITAGE RESOURCES RECOMMENDED FOR PHASE III MITIGATION IN STAR-ORION SOUTH DIAMOND PROJECT AREA

Golder Associates
Saskatoon, Saskatchewan

PROJECT	10-1361-0045		FILE No.	
DESIGN			SCALE AS SHOWN	REV. 0
GIS	MGD	20/10/10	FIGURE: 3	
CHECK	PY	08/11/10		
REVIEW	BN	08/11/10		



2 0 2
SCALE 1:100 METRES

Legend
- Trail
- Positive Shovel Test
- Negative Shovel Test
- Artifact
- Trees
- Excavation Unit
- Cabin Outline (mound)
- Depression

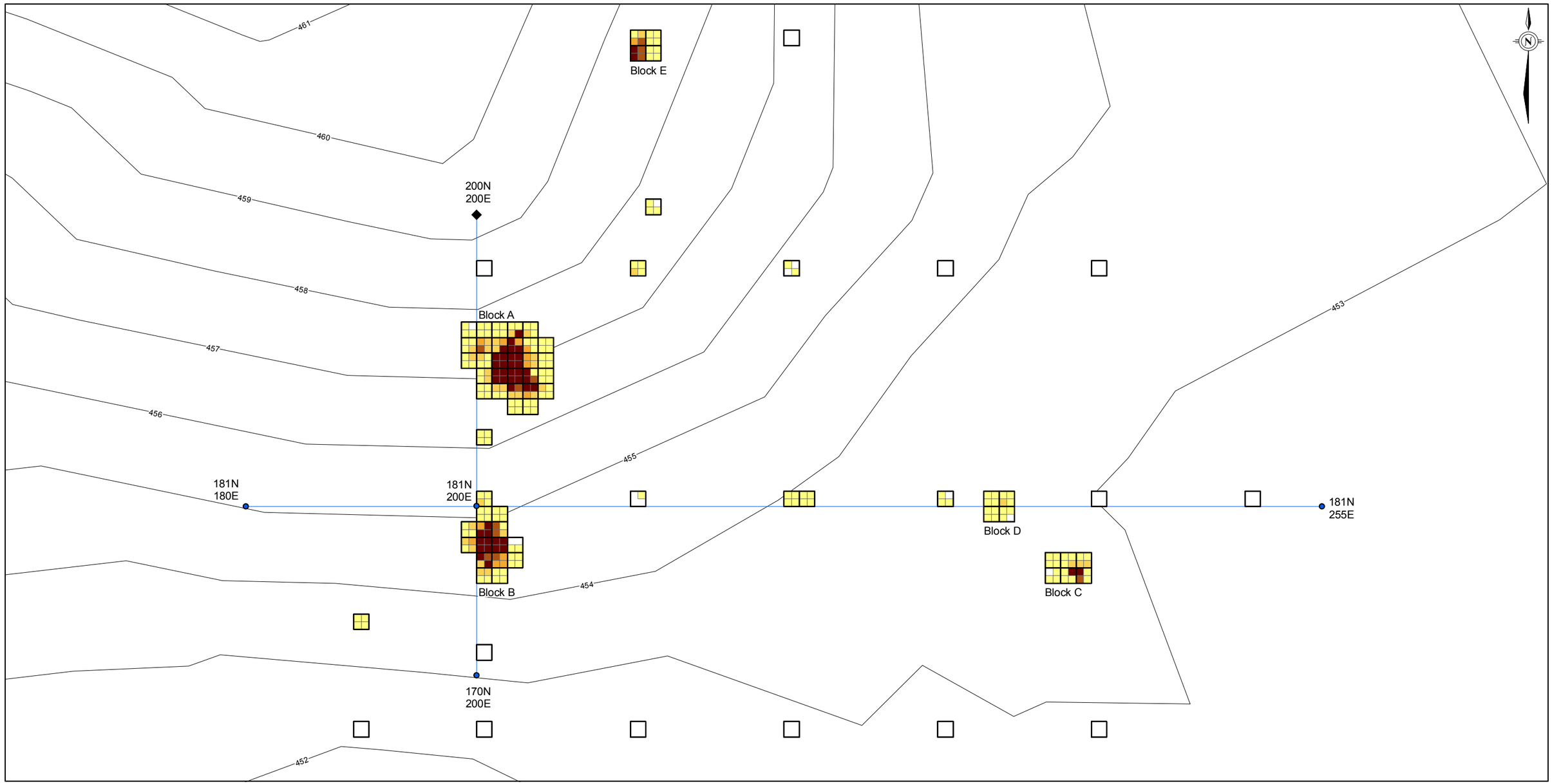
PROJECT
KENSINGTON RESOURCES
HRIA

TITLE
SKETCH MAP OF CABIN FEATURE FROM FhNe 12

Golder Associates
Saskatoon, Saskatchewan

PROJECT	08-1361-0532		FILE No.	
DESIGN			SCALE AS SHOWN	REV. 0
CADD	AJL	04/03/09	**APPENDIX: A1**	
CHECK	PY	06/03/09		
REVIEW	BN	06/03/09		

G:\2008\1361\08-1361-0532 Kensington Resources HRIA FALL\CAD\ Drawing file: 08-1361-0532-2000-HER-Sketch Map.dwg Nov 11, 2010 - 3:48pm



Legend

- Site Datum
- Datum Grid
- Unit Boundary
- Contour - 1M

Frequency

- 1 - 50
- 51 - 100
- 101 - 150
- 151 - 200
- > 200

UNIT	TOTAL	UNIT	TOTAL	UNIT	TOTAL	UNIT	TOTAL	UNIT	TOTAL	UNIT	TOTAL	UNIT	TOTAL
166N 220E	0	177N 237E	11	180N 200E	88	181N 234E	216	189N 200E	169	190N 204E	78	192N 201E	81
173N 192E	109	177N 238E	81	180N 201E	48	181N 250E	6	189N 201E	1755	191N 199E	64	192N 202E	308
176N 200E	124	177N 239E	171	180N 233E	106	185N 200E	93	189N 202E	2276	191N 200E	458	192N 203E	104
176N 201E	106	178N 199E	318	180N 234E	27	187N 202E	43	189N 203E	940	191N 201E	586	196N 210E	120
176N 237E	5	178N 200E	1747	181N 200E	99	187N 203E	50	189N 204E	107	191N 201E	3	196N 220E	11
176N 238E	376	178N 201E	1600	181N 210E	1	188N 200E	51	190N 199E	102	191N 202E	1046	200N 211E	5
176N 239E	508	178N 202E	6	181N 220E	43	188N 201E	187	190N 200E	123	191N 203E	194	210N 210E	1081
177N 200E	712	179N 199E	127	181N 221E	43	188N 202E	551	190N 201E	1696	191N 204E	43	210N 211E	107
177N 201E	558	179N 200E	813	181N 230E	15	188N 203E	892	190N 202E	2049	192N 199E	6	211N 210E	402
177N 202E	83	179N 201E	457	181N 233E	58	188N 204E	122	190N 203E	456	192N 200E	45	211N 211E	78

5 0 5

SCALE 1:250 METRES

Reference:
Contours derived from ShoreGold LiDAR Survey
Datum Grid on True North
NAD83 UTM Zone 13

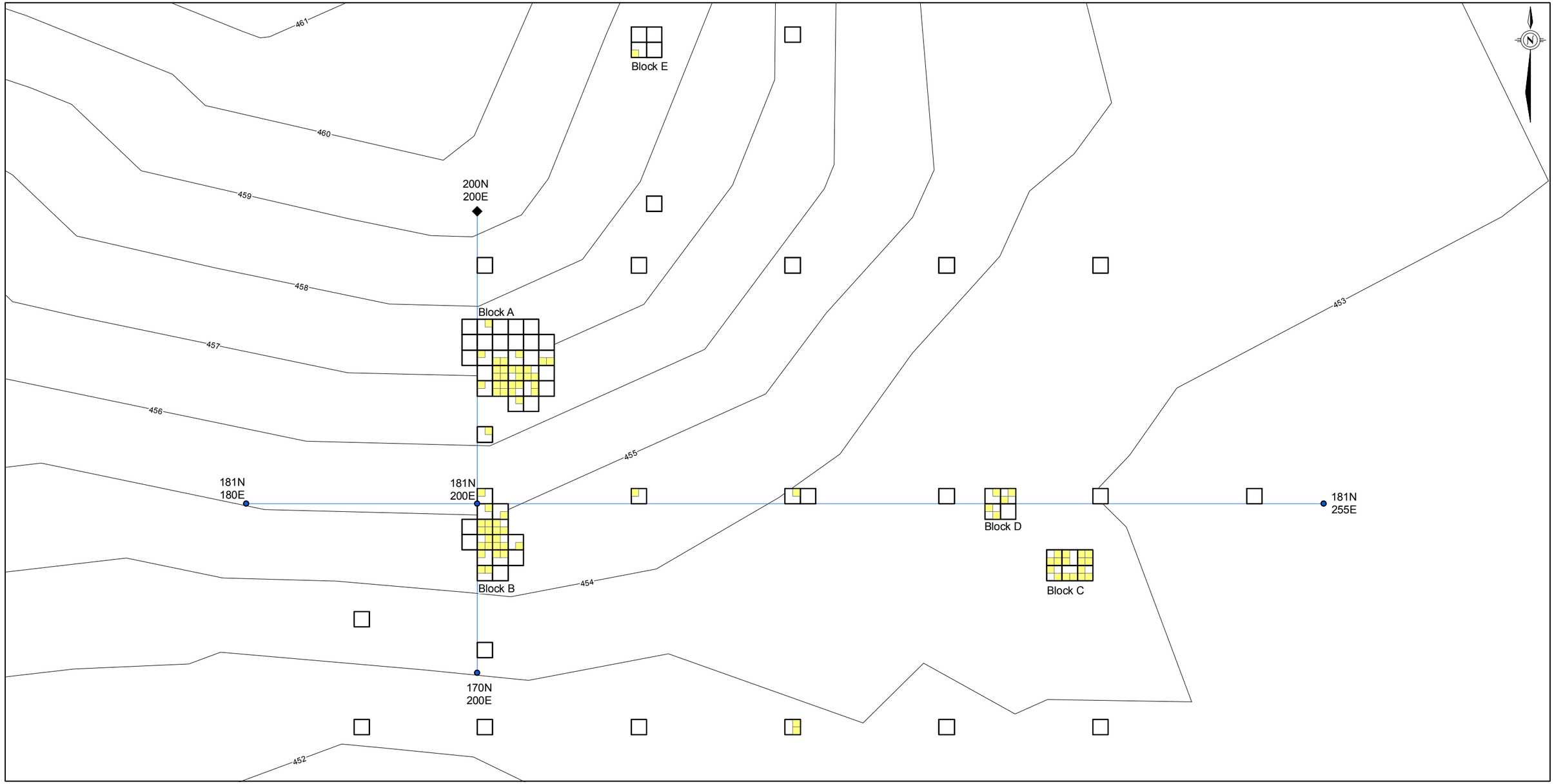
PROJECT
SHORE GOLD INC.

TITLE
FhNe 11
LITHIC FREQUENCY

Golder Associates
Saskatoon, Saskatchewan

PROJECT		08-1361-0517	FILE No.
DESIGN			SCALE AS SHOWN / REV. 0
GIS	DHGH	27/05/09	**APPENDIX: B1a**
CHECK	PY	09/02/10	
REVIEW	BN	09/02/10	

G:\2008\1361\08-1361-0517 ShoreGold Heritage Baseline\GIS\08-1361-0517-Figure B1a-FhNe11 Heritage Site Catalogue - Lithic.mxd



5 0 5

SCALE 1:250 METRES

Legend

- Site Datum
- Datum Grid
- Unit Boundary
- Contour - 1M

Frequency

- 1 - 50
- 51 - 100
- 101 - 150
- 151 - 200
- > 200

UNIT	TOTAL	UNIT	TOTAL	UNIT	TOTAL	UNIT	TOTAL
166N 220E	5	178N 200E	18	181N 220E	1	189N 202E	7
176N 200E	4	178N 201E	8	181N 233E	9	189N 203E	7
176N 237E	3	178N 202E	1	181N 234E	5	190N 200E	3
176N 238E	3	179N 200E	16	185N 200E	2	190N 201E	12
176N 239E	28	179N 201E	6	187N 202E	2	190N 202E	1
177N 200E	1	180N 200E	4	188N 200E	1	190N 204E	3
177N 201E	3	180N 201E	1	188N 201E	9	192N 200E	1
177N 237E	11	180N 233E	3	188N 202E	14	210N 210E	2
177N 238E	4	181N 200E	1	188N 203E	7		
177N 239E	14	181N 210E	1	189N 201E	17		

Reference:
Contours derived from ShoreGold LiDAR Survey
Datum Grid on True North
NAD83 UTM Zone 13

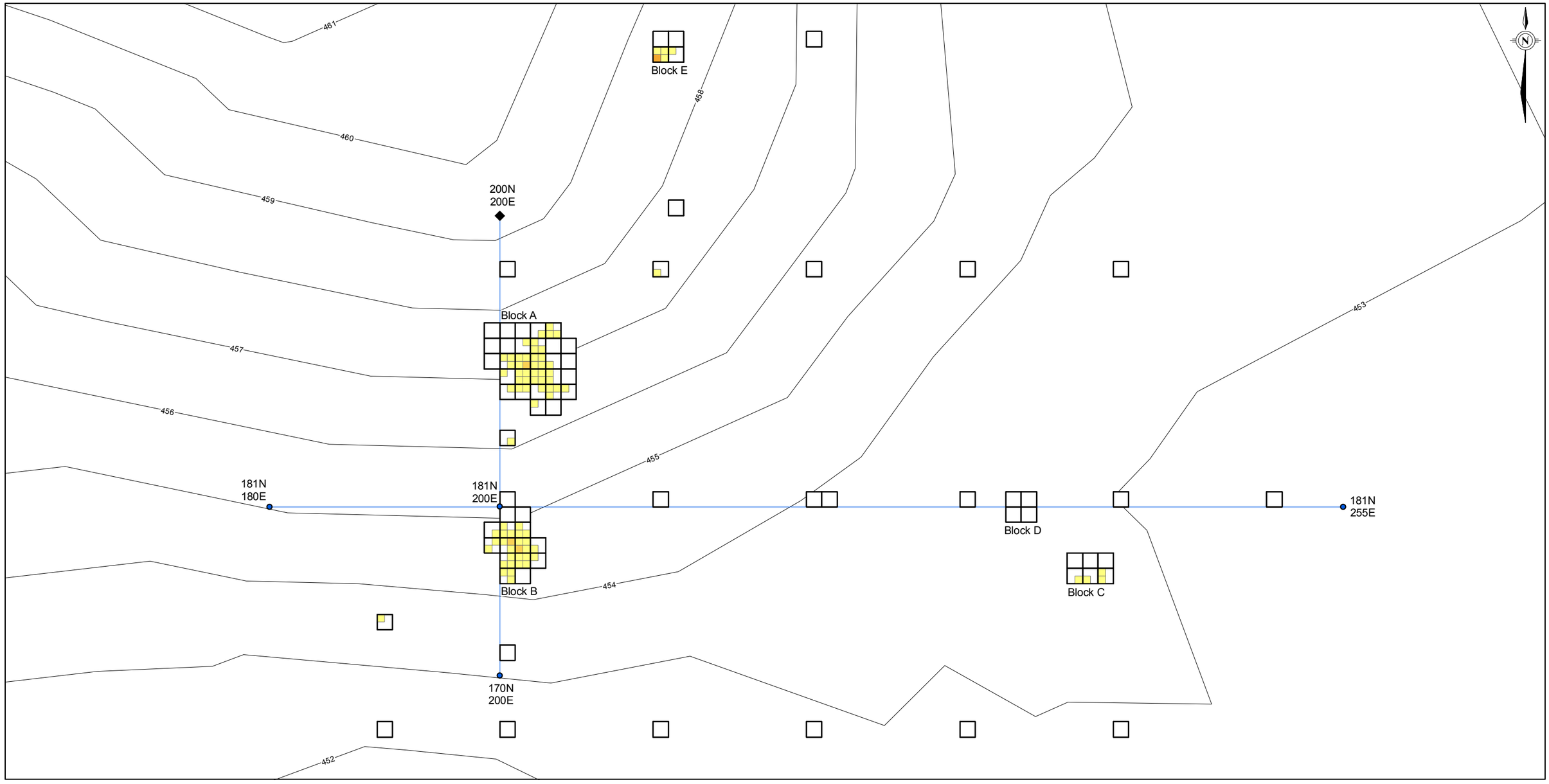
PROJECT
SHORE GOLD INC.

TITLE
FhNe 11
FIRE-CRACKED ROCK FREQUENCY

Golder Associates
Saskatoon, Saskatchewan

PROJECT		08-1361-0517	FILE No.
DESIGN			SCALE AS SHOWN / REV. 0
GIS	DHGH	27/05/09	**APPENDIX: B1b**
CHECK	PY	09/02/10	
REVIEW	BN	09/02/10	

G:\2008\1361\08-1361-0517 ShoreGold Heritage Baseline\GIS\08-1361-0517-Figure B1b-FhNe11 Heritage Site Catalogue - FCR.mxd



5 0 5

SCALE 1:250 METRES

Legend

Site Datum	Frequency
Datum Grid	1 - 50
Unit Boundary	51 - 100
Contour - 1M	101 - 150
	151 - 200
	> 200

UNIT	TOTAL	UNIT	TOTAL	UNIT	TOTAL	UNIT	TOTAL
173N 192E	1	178N 201E	103	188N 203E	17	191N 201E	7
176N 200E	54	178N 202E	1	188N 204E	2	191N 202E	8
176N 237E	1	179N 199E	1	189N 200E	1	192N 202E	1
176N 238E	1	179N 200E	79	189N 201E	36	192N 203E	8
176N 239E	3	179N 201E	7	189N 202E	29	196N 210E	2
177N 200E	52	185N 200E	14	189N 203E	6	210N 210E	115
177N 201E	16	187N 202E	2	190N 200E	15	210N 211E	1
177N 202E	1	188N 200E	6	190N 201E	126		
178N 199E	5	188N 201E	10	190N 202E	97		
178N 200E	152	188N 202E	1	190N 203E	2		

Reference:
Contours derived from ShoreGold LiDAR Survey
Datum Grid on True North
NAD83 UTM Zone 13

PROJECT

SHORE GOLD INC.

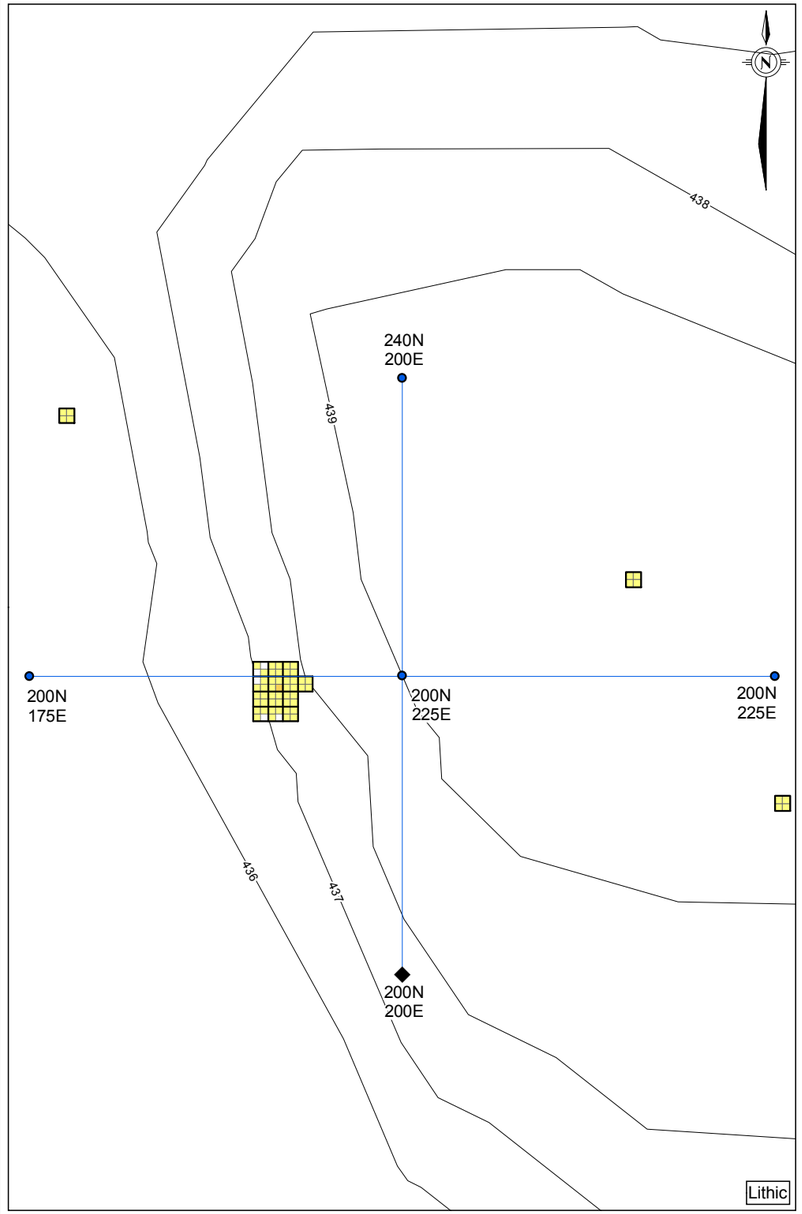
TITLE

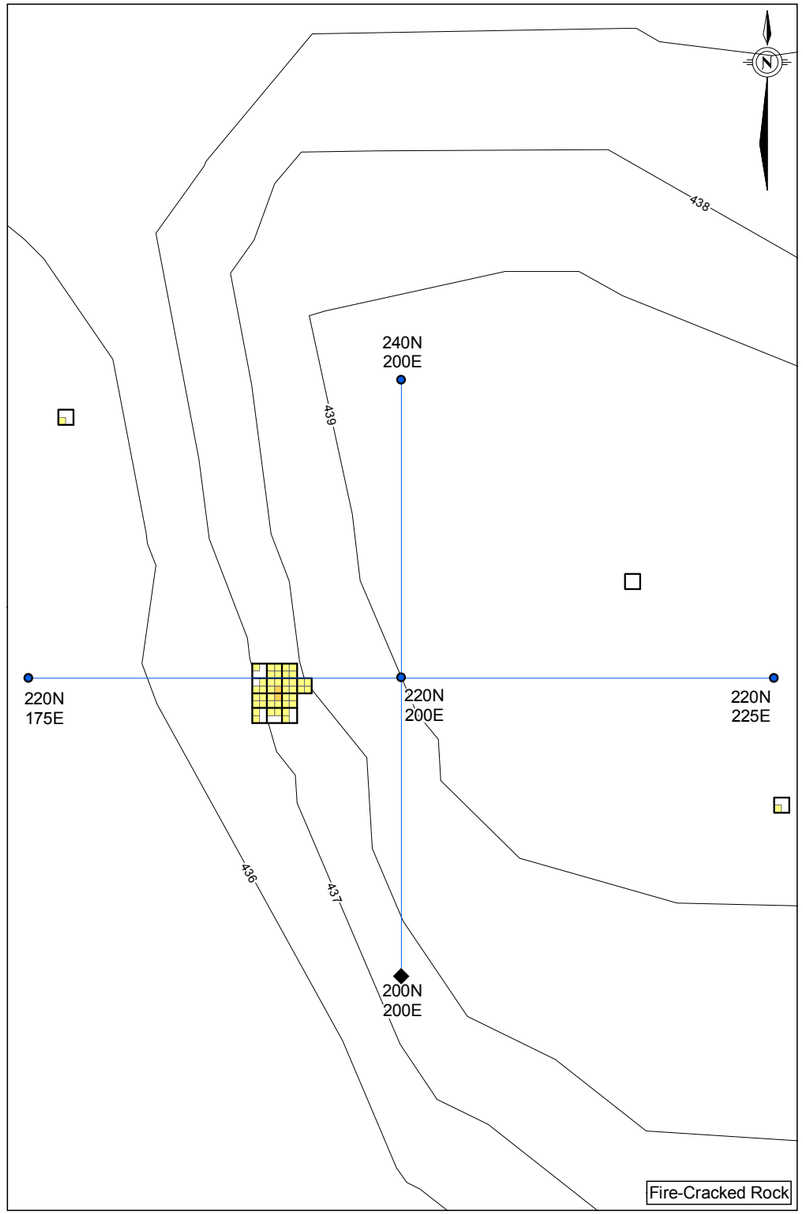
FhNe 11
FAUNAL FREQUENCY

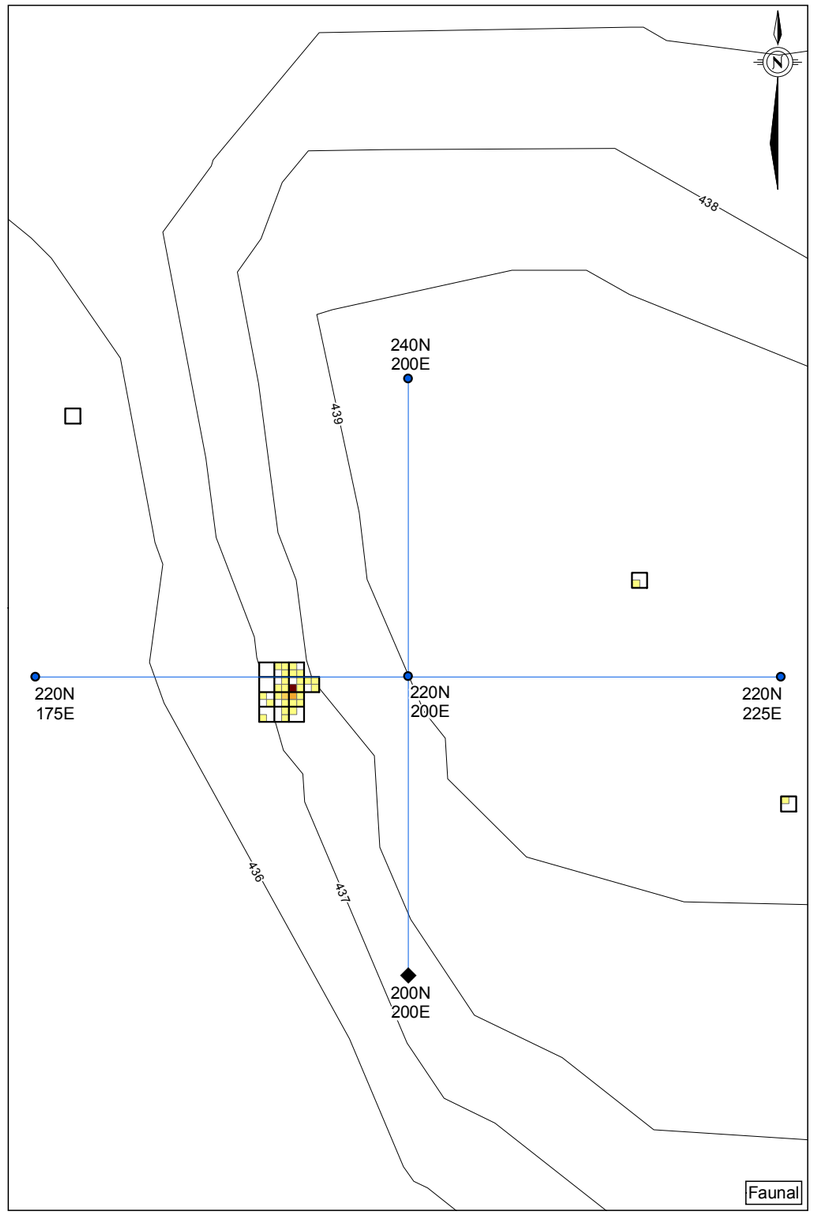
Golder Associates
Saskatoon, Saskatchewan

PROJECT		08-1361-0517		FILE No.	
DESIGN				SCALE AS SHOWN	REV. 0
GIS	DHGH	27/05/09	**APPENDIX: B1c**		
CHECK	PY	09/02/10			
REVIEW	BN	09/02/10			

G:\2008\1361\08-1361-0517 ShoreGold Heritage Baseline\GIS\08-1361-0517 FhNe11 Heritage Site Catalogue - Faunal.mxd







10 0 10

SCALE 1:400 METRES

Legend

- Site Datum
- Datum Grid
- Unit Boundary
- Contour - 1M

Frequency

- 1 - 50
- 50 - 100
- 100 - 150
- 150 - 200
- > 200

UNIT	TOTAL LITHIC	TOTAL FCR	TOTAL FAUNAL	UNIT	TOTAL LITHIC	TOTAL FCR	TOTAL FAUNAL
211N 225E	61	1	1	219N 193E	33	63	11
217N 190E	17	3	2	220N 190E	2	2	-
217N 191E	11	4	7	220N 191E	19	28	44
217N 192E	30	10	1	220N 192E	24	28	7
218N 190E	53	12	4	226N 215E	24	-	1
218N 191E	75	108	80	237N 177E	70	1	-
218N 192E	86	52	206				
219N 190E	14	27	-				
219N 191E	96	108	53				
219N 192E	106	63	248				

Reference:
Contours derived from ShoreGold LiDAR Survey
Datum Grid on True North
NAD83 UTM Zone13

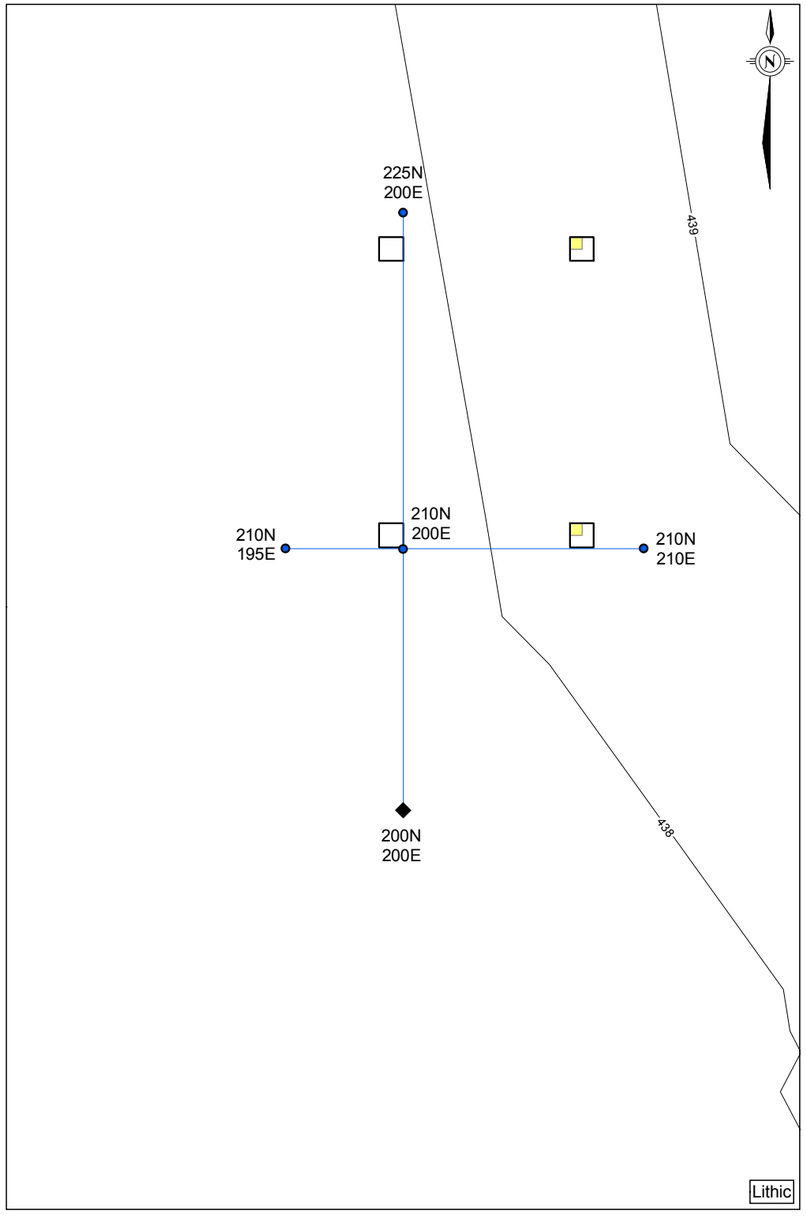
PROJECT
SHORE GOLD INC.

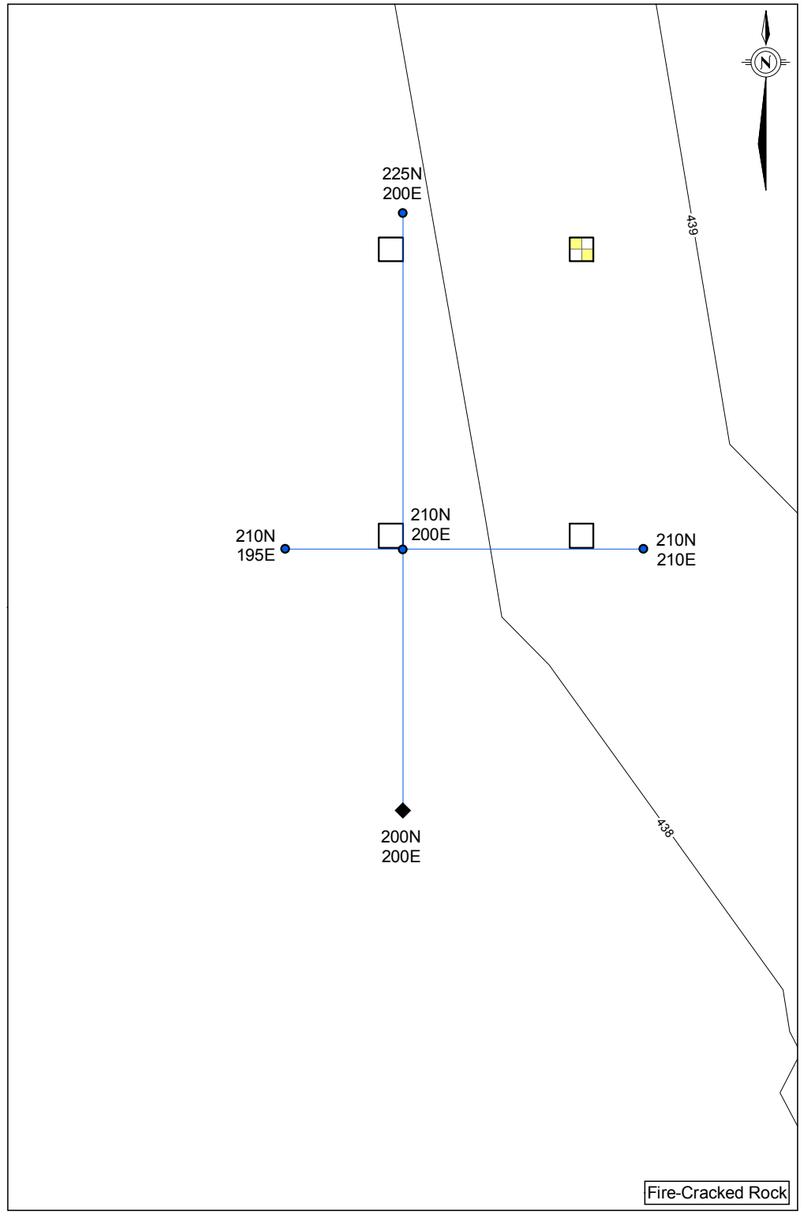
TITLE
FhNe 82 AREA A

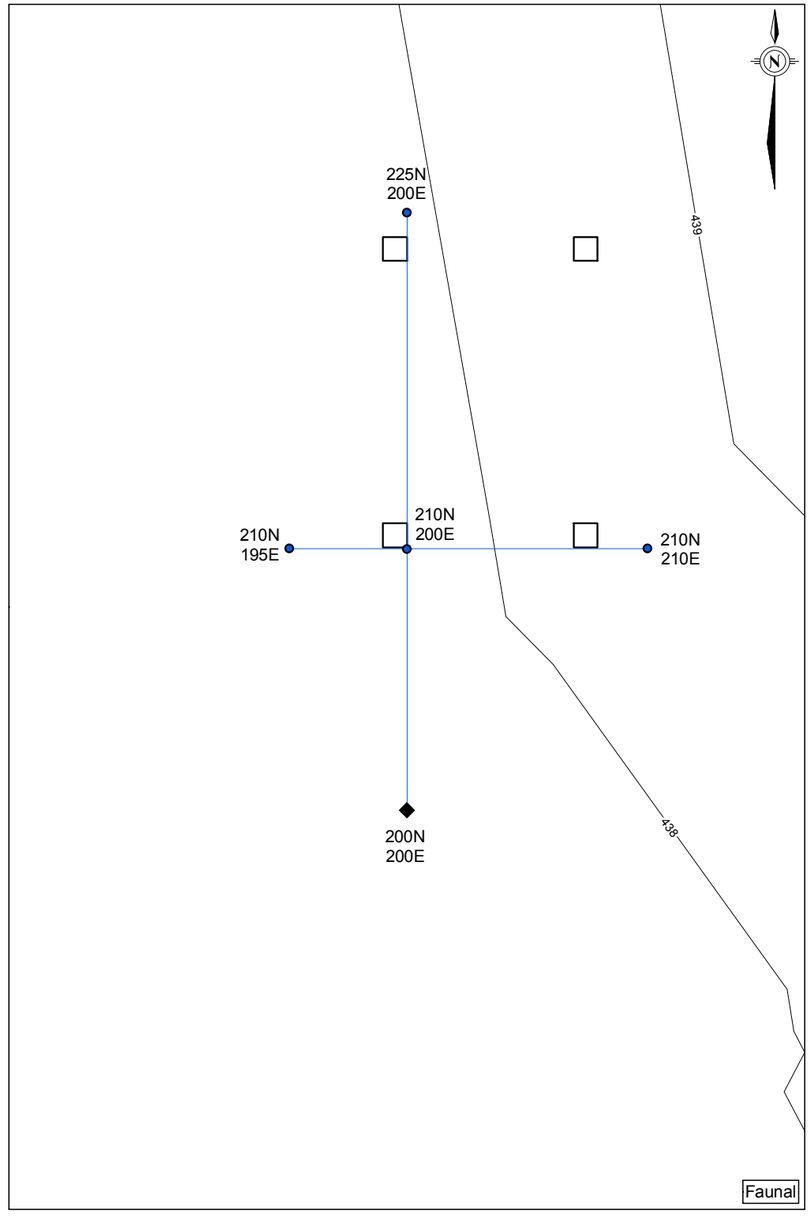
Golder Associates
Saskatoon, Saskatchewan

PROJECT		08-1361-0517	FILE No.
DESIGN			SCALE AS SHOWN REV. 0
GIS	DHGH	01/06/09	**APPENDIX: B2**
CHECK	PY	09/02/10	
REVIEW	BN	09/02/10	

G:\2008\1361\08-1361-0517 ShoreGold Heritage Baseline\GIS\08-1361-0517-Figure B2-FhNe82 Area A Heritage Site Catalogue.mxd







5 0 5

SCALE 1:250 METRES

Legend

Site Datum	Frequency
Datum Grid	1 - 50
Contour - 1M	51 - 100
Unit Boundary	101 - 150
	151 - 200
	> 200

UNIT	TOTAL LITHIC	TOTAL FCR
210N 207E	2	-
222N 207E	0	3

Reference:
Contours derived from ShoreGold LiDAR Survey
Datum Grid on True North
NAD83 Zone13

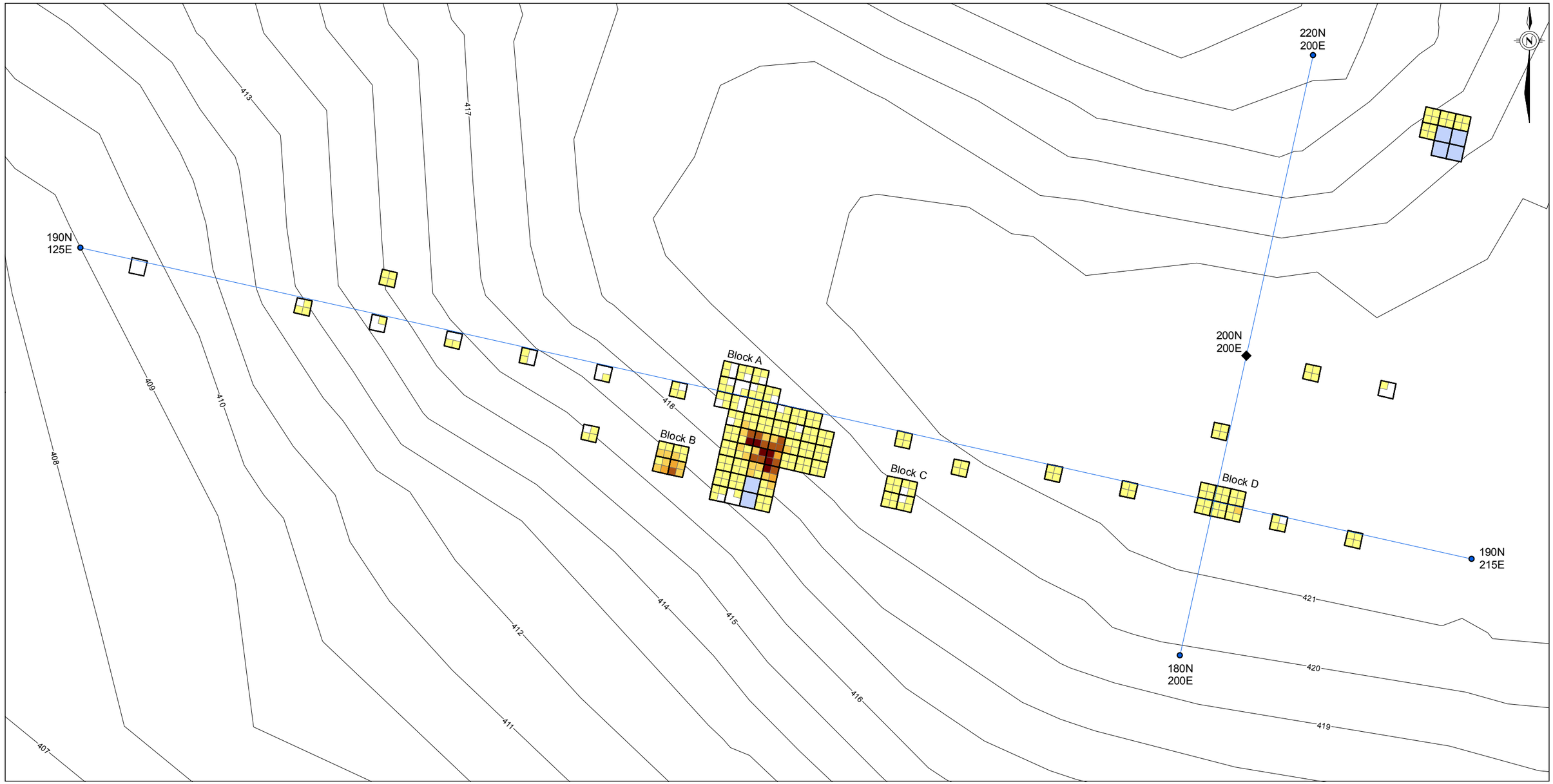
PROJECT
SHORE GOLD INC.

TITLE
FhNe 82 AREA B

Golder Associates
Saskatoon, Saskatchewan

PROJECT	08-1361-0517		FILE No.	
DESIGN			SCALE AS SHOWN	REV. 0
GIS	DHGH	01/06/09	**APPENDIX: B3**	
CHECK	PY	09/02/10		
REVIEW	BN	09/02/10		

G:\2008\1361\08-1361-0517 ShoreGold Heritage Baseline\GIS\08-1361-0517-Figure B3-FhNe82 Area B Heritage Site Catalogue.mxd



UNIT	TOTAL	UNIT	TOTAL	UNIT	TOTAL	UNIT	TOTAL	UNIT	TOTAL	UNIT	TOTAL
183N 168E	16	185N 171E	556	187N 170E	670	189N 139E	3	189N 189E	54	191N 167E	4
183N 169E	1	185N 179E	15	187N 171E	574	189N 144E	3	189N 194E	69	191N 168E	3
183N 171E	44	185N 180E	5	187N 172E	117	189N 149E	5	189N 199E	61	191N 169E	6
184N 164E	319	186N 168E	44	187N 173E	38	189N 154E	7	189N 200E	68	192N 144E	71
184N 165E	452	186N 169E	215	187N 174E	42	189N 159E	2	189N 201E	143	194N 199E	20
184N 168E	26	186N 170E	690	187N 200E	1	189N 164E	3	189N 204E	30	199N 204E	37
184N 169E	28	186N 171E	894	188N 168E	29	189N 167E	5	189N 209E	26	199N 209E	2
184N 171E	109	186N 172E	139	188N 169E	129	189N 168E	4	190N 167E	8	216N 208E	34
185N 159E	13	186N 173E	16	188N 170E	107	189N 169E	18	190N 168E	2	217N 208E	39
185N 164E	191	186N 174E	19	188N 171E	36	189N 170E	11	190N 169E	9	217N 209E	72
185N 165E	153	186N 179E	19	188N 172E	17	189N 171E	8	190N 170E	7	217N 210E	36
185N 168E	21	186N 180E	5	188N 173E	20	189N 172E	13	190N 199E	33		
185N 169E	124	187N 168E	52	188N 174E	42	189N 173E	18	190N 200E	35		
185N 170E	258	187N 169E	499	188N 183E	38	189N 179E	73	190N 201E	93		

Legend

	Frequency
Site Datum	1 - 50
Datum Grid	51 - 100
Unit Boundary	101 - 150
Contour - 1M	151 - 200
	> 200
	WHSI Permit 06-103

5 0 5
SCALE 1:250 METRES

Reference:
Contours derived from ShoreGold LiDAR Survey
Datum Grid on Magnetic North
(12.5 Declination)
NAD83 UTM Zone13

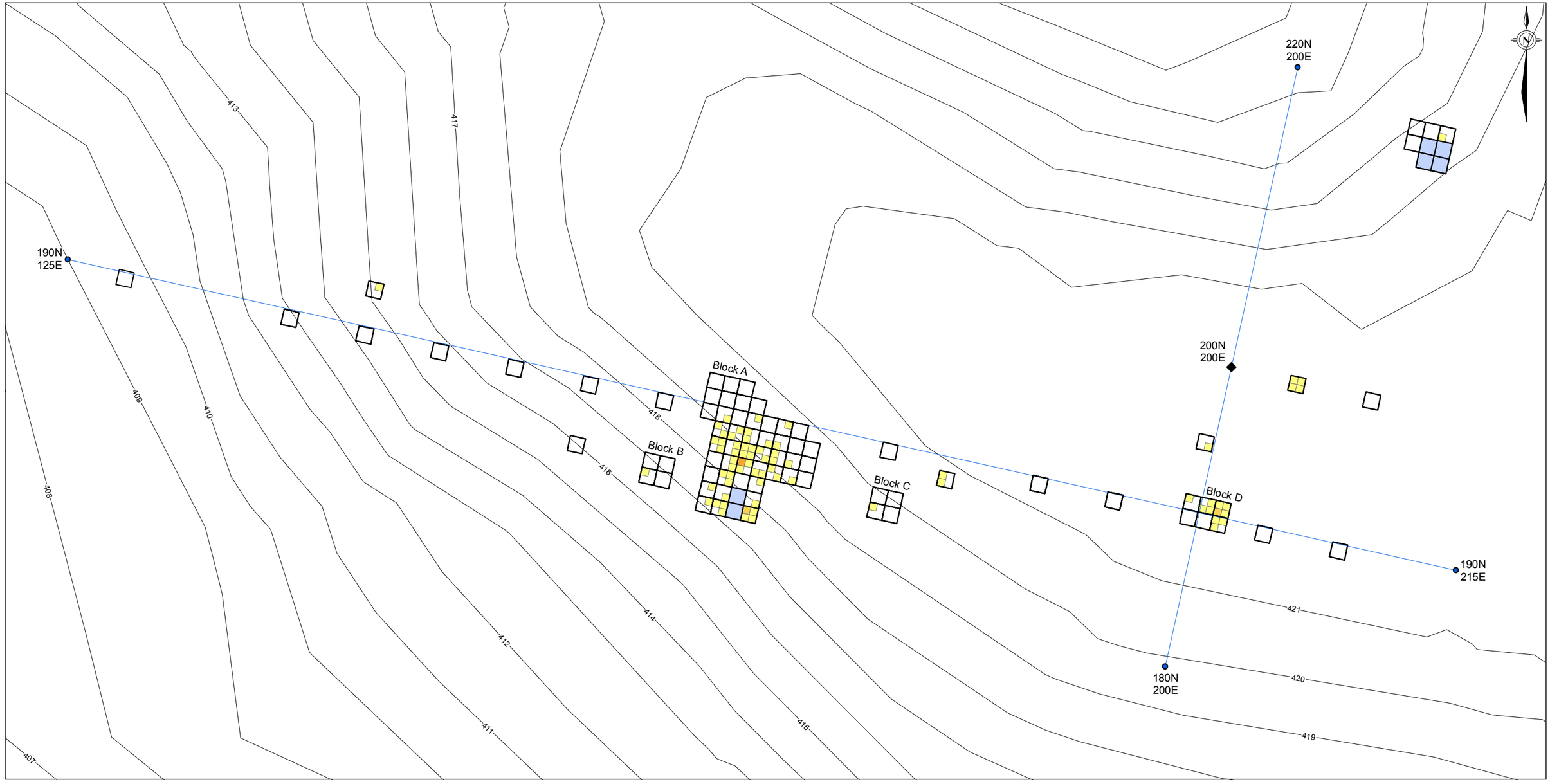
PROJECT
SHORE GOLD INC.

TITLE
FhNe 88
LITHIC FREQUENCY

Golder Associates
Saskatoon, Saskatchewan

PROJECT	08-1361-0517	FILE No.	
DESIGN		SCALE AS SHOWN	REV. 0
GIS	DHGH	27/05/09	**APPENDIX: B4a**
CHECK	PY	09/02/10	
REVIEW	BN	09/02/10	

G:\2008\1361\08-1361-0517 ShoreGold Heritage Baseline\GIS\08-1361-0517 FhNe88 Heritage Site Catalogue - Lithic.mxd



Legend

- Site Datum
- Datum Grid
- Unit Boundary
- Contour - 1M

Frequency

- 1 - 50
- 51 - 100
- 101 - 150
- 151 - 200
- > 200
- WHSI Permit 06-103

UNIT	TOTAL	UNIT	TOTAL	UNIT	TOTAL	UNIT	TOTAL	UNIT	TOTAL
183N 168E	9	185N 179E	2	187N 172E	5	189N 170E	2	190N 170E	2
183N 169E	18	186N 169E	14	187N 173E	4	189N 171E	1	190N 199E	2
183N 171E	124	186N 170E	118	188N 168E	5	189N 172E	2	190N 200E	17
184N 164E	7	186N 171E	22	188N 169E	4	189N 173E	1	190N 201E	120
184N 165E	2	186N 172E	46	188N 170E	9	189N 194E	1	192N 144E	5
184N 168E	6	186N 173E	4	188N 171E	6	189N 200E	1	194N 199E	4
184N 169E	4	187N 168E	24	188N 172E	14	189N 201E	45	199N 204E	58
184N 171E	5	187N 169E	5	188N 183E	7	189N 204E	1	217N 210E	2
185N 169E	22	187N 170E	36	189N 149E	1	189N 209E	1		
185N 171E	8	187N 171E	16	189N 168E	5	190N 169E	1		

Reference:
Contours derived from ShoreGold LiDAR Survey
Datum Grid on Magnetic North (12.5 Declination)
NAD83 UTM Zone13

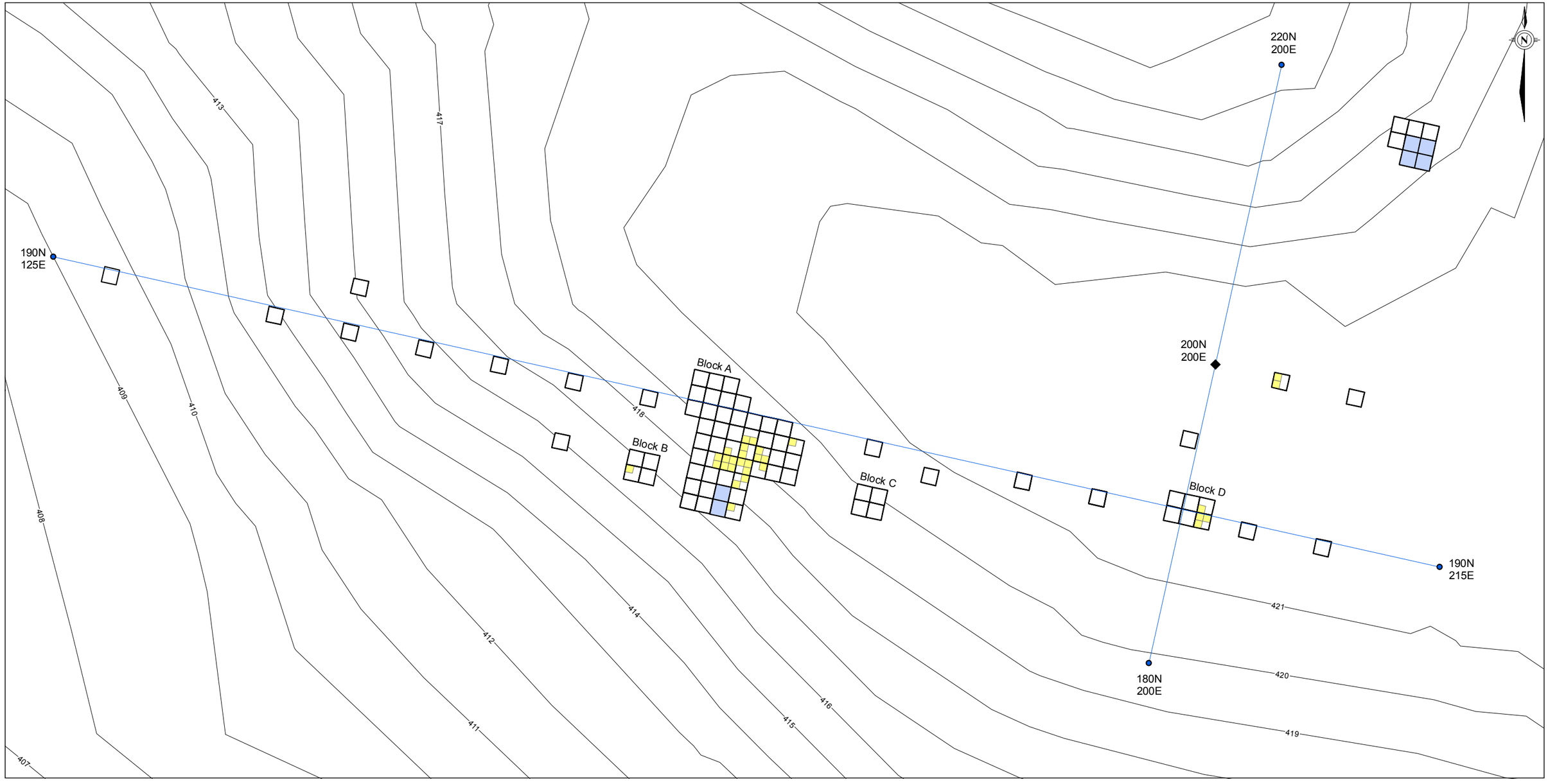
PROJECT
SHORE GOLD INC.

TITLE
FhNe 88
FIRE-CRACKED ROCK FREQUENCY

Golder Associates
Saskatoon, Saskatchewan

PROJECT	08-1361-0517		FILE No.
DESIGN			SCALE AS SHOWN / REV. 0
GIS	DHGH	27/05/09	**APPENDIX: B4b**
CHECK	PY	09/02/10	
REVIEW	BN	09/02/10	

G:\2008\1361\08-1361-0517 ShoreGold Heritage Baseline\GIS\08-1361-0517 FhNe88 Heritage Site Catalogue - FCR.mxd



Legend

- Site Datum
- Datum Grid
- Unit Boundary
- Contour - 1M

Frequency

- 1 - 50
- 51 - 100
- 101 - 150
- 151 - 200
- > 200
- WHSI Permit 06-103

UNIT	TOTAL	UNIT	TOTAL	UNIT	TOTAL
183N 171E	7	187N 169E	1	189N 172E	1
184N 164E	4	187N 170E	4	189N 179E	1
185N 170E	2	187N 171E	16	189N 201E	11
185N 171E	6	187N 172E	31	189N 209E	1
185N 179E	1	187N 173E	1	190N 170E	1
186N 169E	5	188N 171E	13	190N 201E	4
186N 170E	92	188N 172E	2	199N 204E	22
186N 171E	10	188N 173E	2		
186N 172E	2	188N 174E	2		
186N 174E	1	189N 171E	1		

Reference:
Contours derived from ShoreGold LiDAR Survey
Datum Grid on Magnetic North (12.5 Declination)
NAD83 UTM Zone13

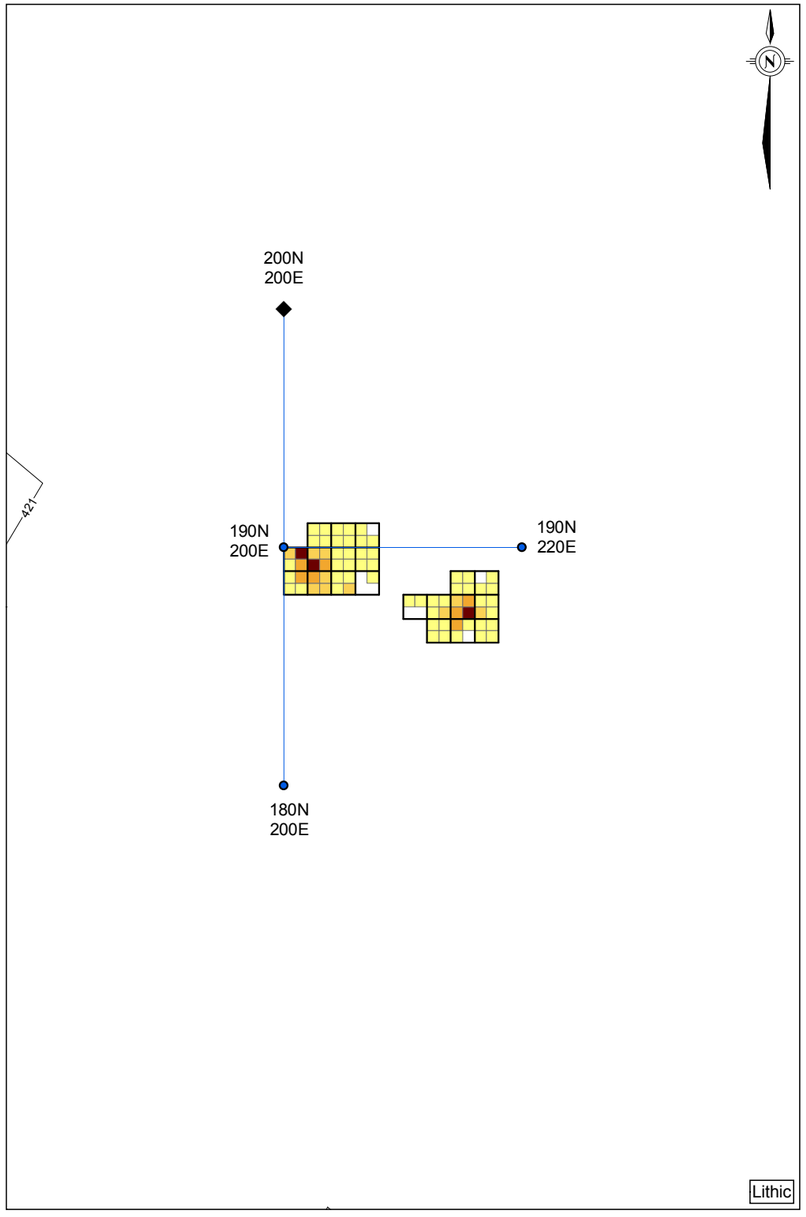
PROJECT
SHORE GOLD INC.

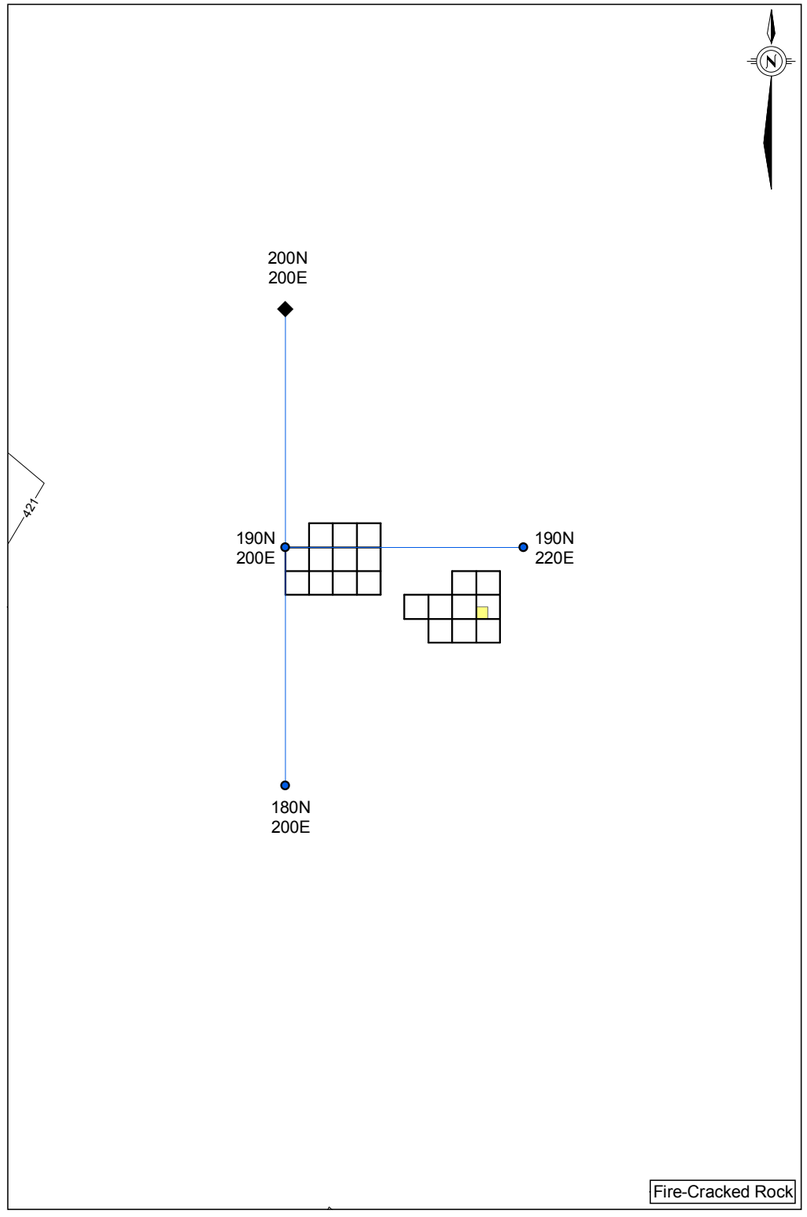
TITLE
FhNe 88
FAUNAL FREQUENCY

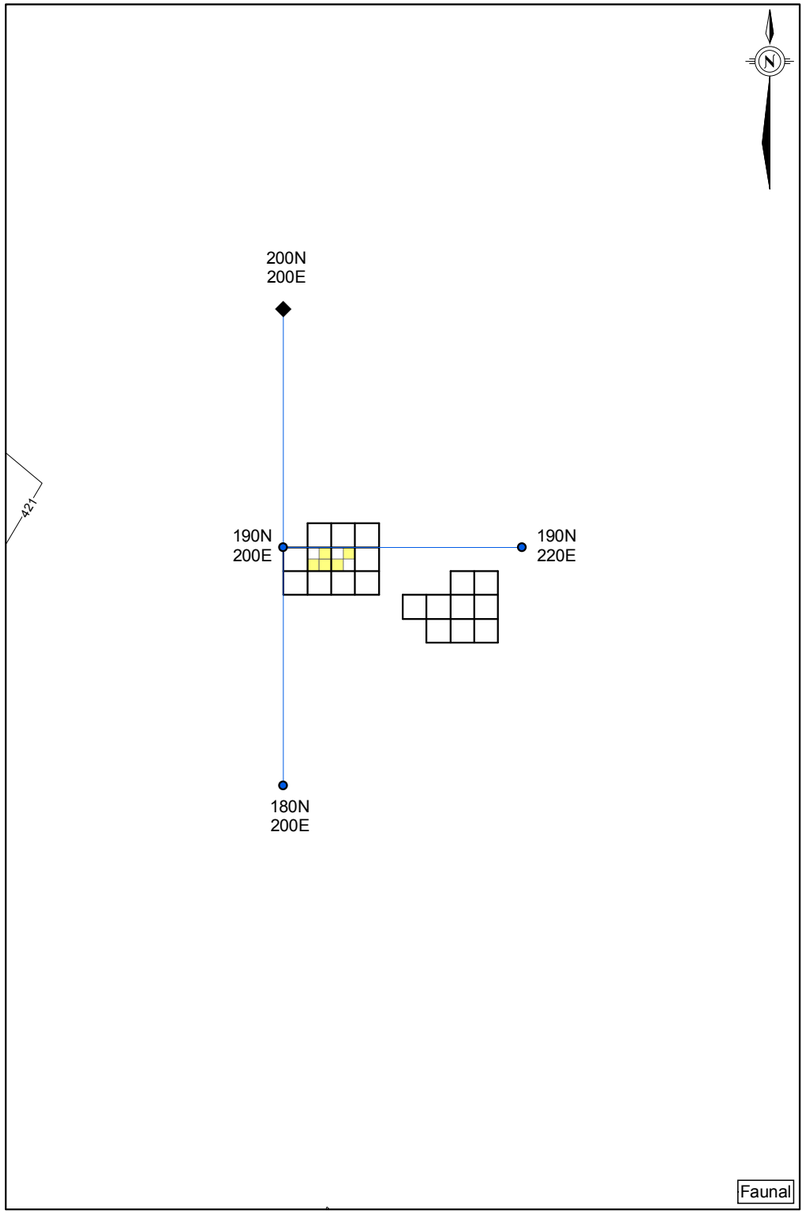
Golder Associates
Saskatoon, Saskatchewan

PROJECT		08-1361-0517	FILE No.
DESIGN			SCALE AS SHOWN / REV. 0
GIS	DHGH	27/05/09	**APPENDIX: B4c**
CHECK	PY	09/02/10	
REVIEW	BN	09/02/10	

G:\2008\1361\08-1361-0517 ShoreGold Heritage Baseline\GIS\08-1361-0517 FhNe88 Heritage Site Catalogue - Faunal.mxd







5 0 5
SCALE 1:250 METRES

Legend

Site Datum	Frequency
Datum Grid	1 - 50
Contour - 1M	51 - 100
Unit Boundary	101 - 150
	151 - 200
	> 200

UNIT	TOTAL LITHIC	TOTAL FCR	TOTAL FAUNAL	UNIT	TOTAL LITHIC	TOTAL FCR	TOTAL FAUNAL
186N 206E	38	-	-	188N 207E	40	-	-
186N 207E	188	-	-	188N 208E	19	-	-
186N 208E	20	-	-	189N 200E	443	-	-
187N 205E	5	-	-	189N 201E	528	-	6
187N 206E	141	-	-	189N 202E	86	-	7
187N 207E	575	-	-	189N 203E	19	-	-
187N 208E	146	2	-	190N 201E	73	-	-
188N 200E	213	-	-	190N 202E	61	-	-
188N 201E	385	-	-	190N 203E	6	-	-
188N 202E	184	-	-				
188N 203E	20	-	-				

Reference:
Contours derived from ShoreGold LiDAR Survey
Datum Grid on True North
NAD83 UTM Zone13

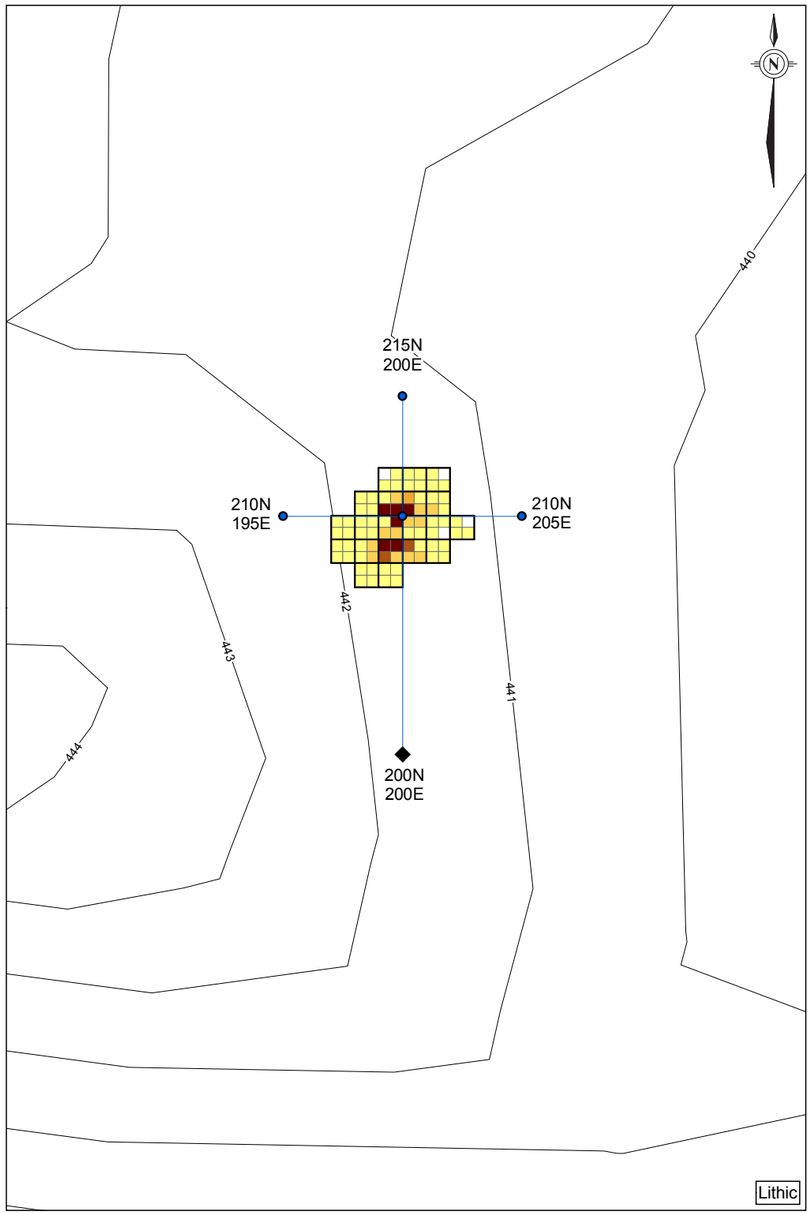
PROJECT
SHORE GOLD INC.

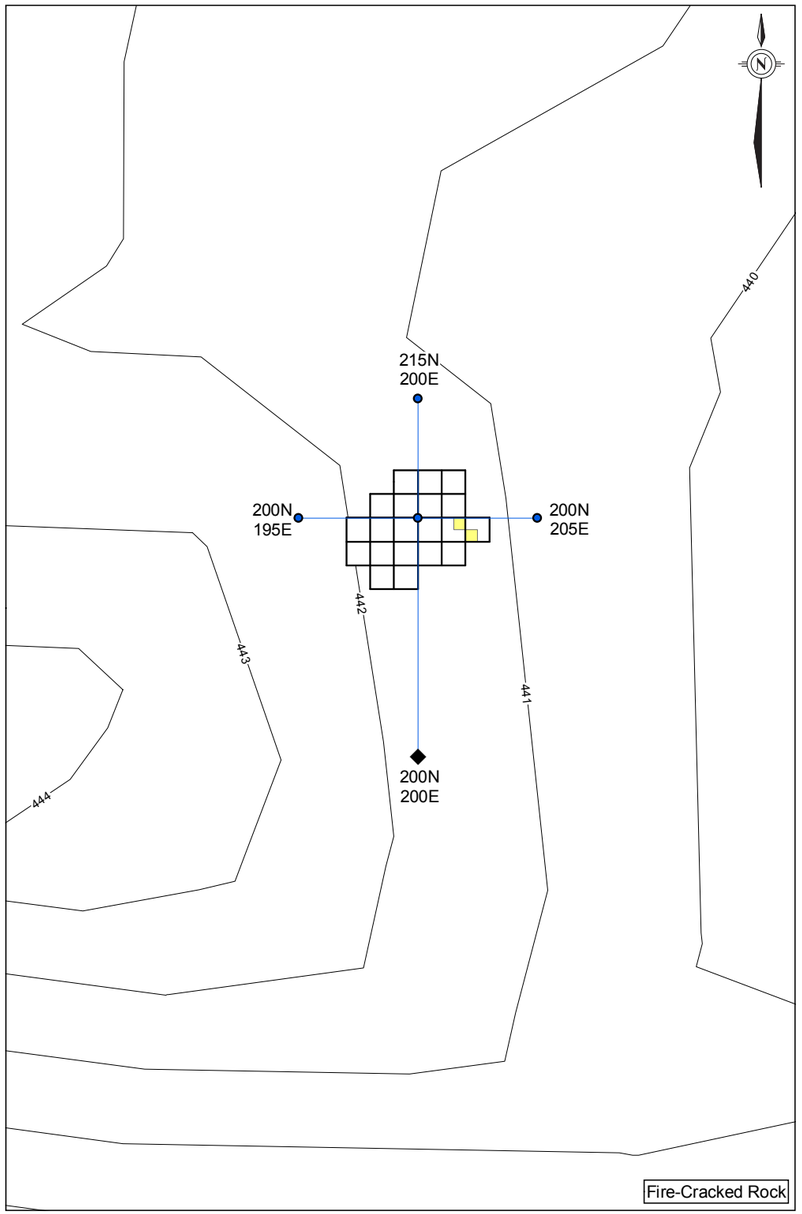
TITLE
FhNe 98

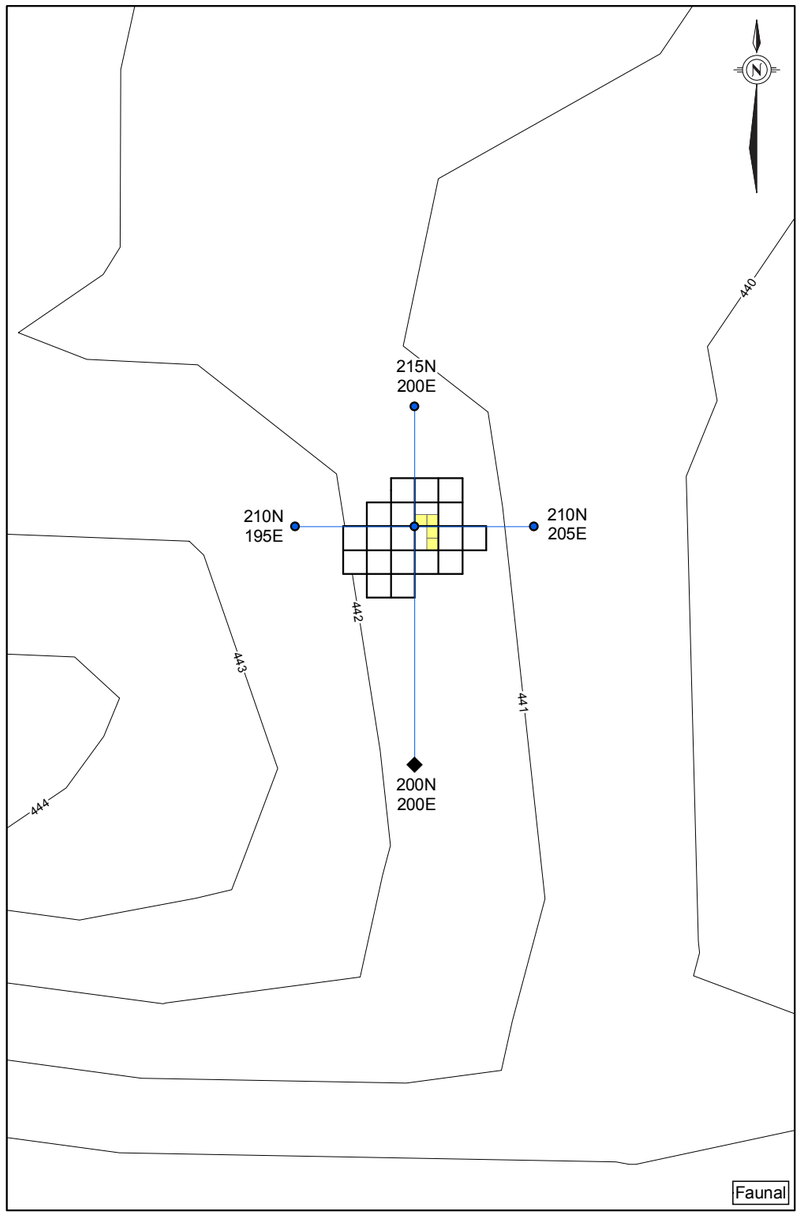
Golder Associates
Saskatoon, Saskatchewan

PROJECT	08-1361-0517		FILE No.		
DESIGN			SCALE AS SHOWN	REV.	0
GIS	DHGH	01/06/09	**APPENDIX: B5**		
CHECK	PY	09/02/10			
REVIEW	BN	09/02/10			

G:\2008\1361\08-1361-0517 ShoreGold Heritage Baseline\GIS\08-1361-0517 FhNe98 Heritage Site Catalogue.mxd







5 0 5

SCALE 1:250 METRES

Legend

- Site Datum
- Datum Grid
- Contour - 1M
- Unit Boundary

Frequency

- 1 - 50
- 51 - 100
- 101 - 150
- 151 - 200
- > 200

UNIT	TOTAL LITHIC	TOTAL FCR	TOTAL FAUNAL	UNIT	TOTAL LITHIC	TOTAL FCR	TOTAL FAUNAL
207N 198E	6	-	-	209N 200E	235	-	6
207N 199E	8	-	-	209N 201E	91	4	-
208N 197E	8	-	-	209N 202E	35	1	-
208N 198E	153	-	-	210N 198E	46	-	-
208N 199E	1072	-	-	210N 199E	788	-	-
208N 200E	354	-	-	210N 200E	438	-	7
208N 201E	64	-	-	210N 201E	110	-	-
209N 197E	12	-	-	211N 199E	21	-	-
209N 198E	111	-	-	211N 200E	21	-	-
209N 199E	408	-	-	211N 201E	23	-	-

Reference:
Contours derived from ShoreGold LiDAR Survey
Datum Grid on True North
NAD83 NTS Zone13

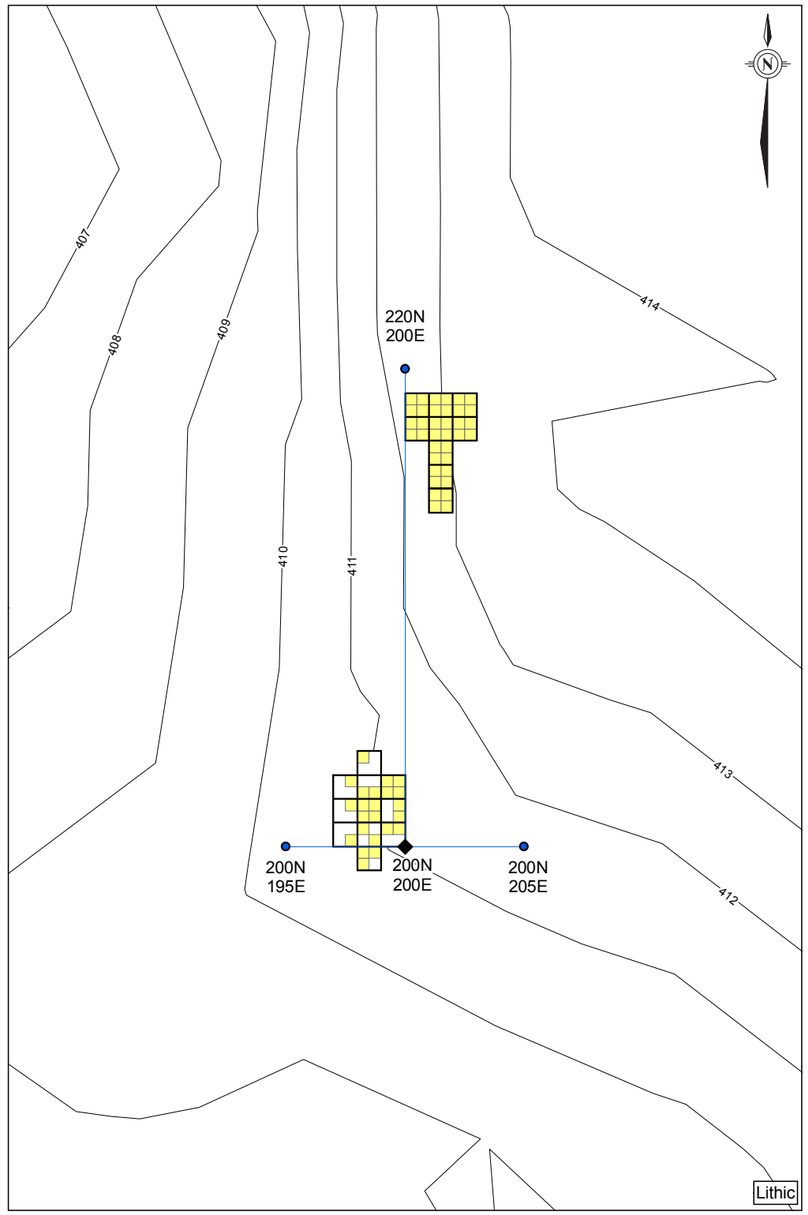
PROJECT
SHORE GOLD INC.

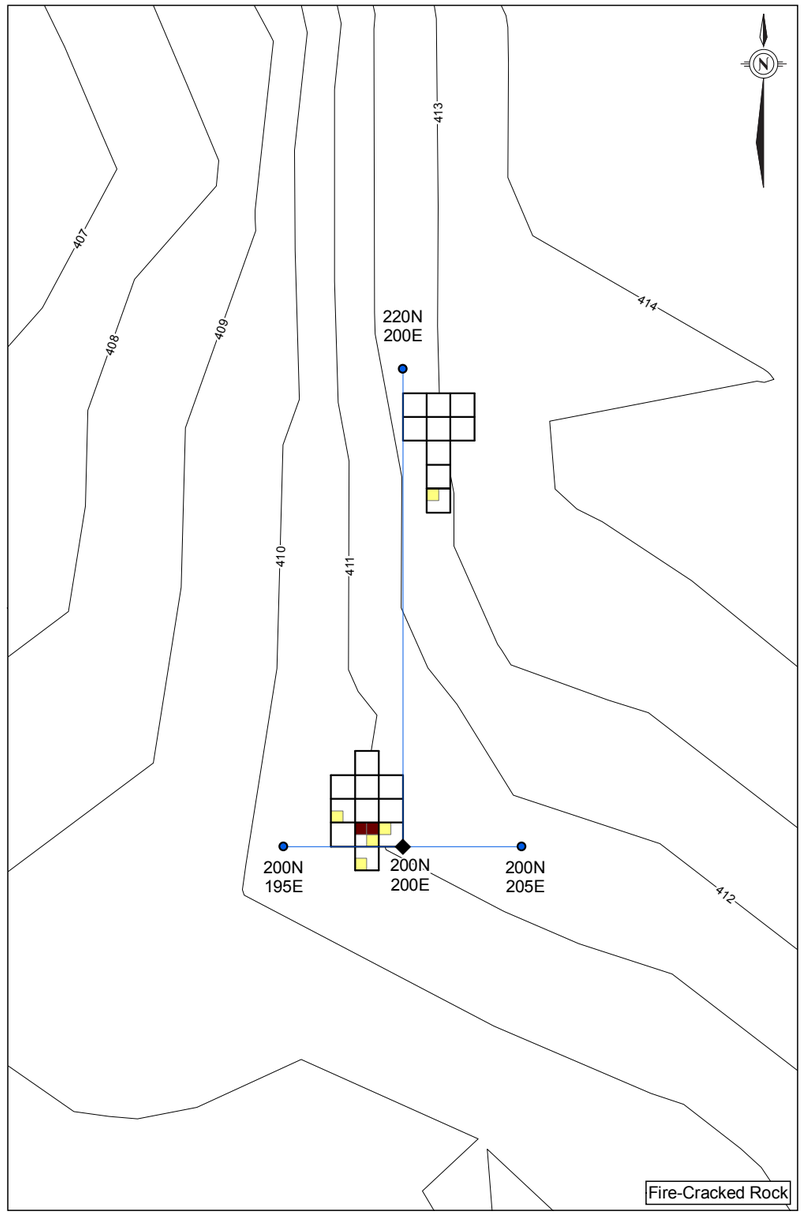
TITLE
FhNe 115

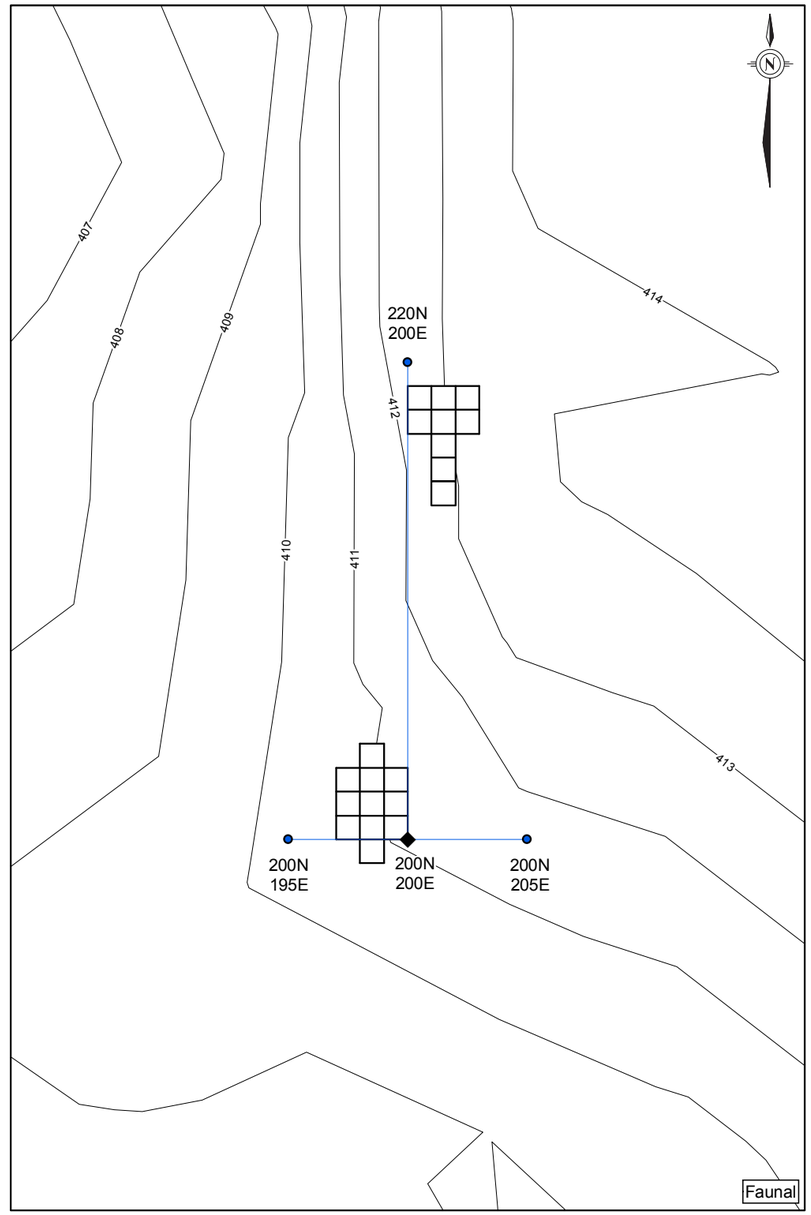
Golder Associates
Saskatoon, Saskatchewan

PROJECT	08-1361-0517		FILE No.
DESIGN			SCALE AS SHOWN / REV. 0
GIS	DHGH	01/06/09	**APPENDIX: B6**
CHECK	PY	09/02/10	
REVIEW	BN	09/02/10	

G:\2008\1361\08-1361-0517 ShoreGold Heritage Baseline\GIS\08-1361-0517-Figure B6-FhNe115 Heritage Site Catalogue.mxd







5 0 5
SCALE 1:250 METRES

Legend

Site Datum	Frequency
Datum Grid	1 - 50
Contour - 1M	51 - 100
Unit Boundary	101 - 150
	151- 200
	> 200

UNIT	TOTAL LITHIC	TOTAL FCR	UNIT	TOTAL LITHIC	TOTAL FCR
199N 198E	3	2	203N 198E	1	-
200N 197E	1	-	214N 201E	20	3
200N 198E	2	547	215N 201E	29	-
200N 199E	3	1	216N 201E	35	-
201N 197E	1	5	217N 200E	27	-
201N 198E	7	13	217N 201E	33	-
201N 199E	3	-	217N 202E	35	-
202N 197E	1	-	218N 200E	37	-
202N 198E	6	-	218N 201E	45	-
202N 199E	7	-	218N 202E	27	-

Reference:
Contours derived from ShoreGold LiDAR Survey
Datum Grid on True North
NAD83 UTM Zone13

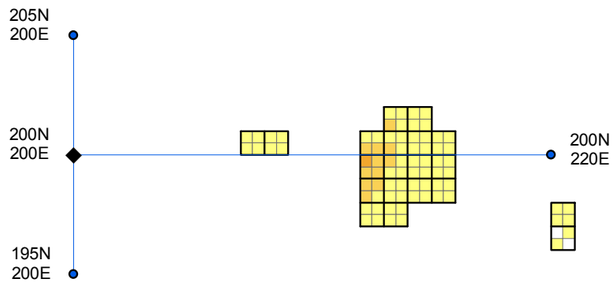
PROJECT
SHORE GOLD INC.

TITLE
FhNe 120

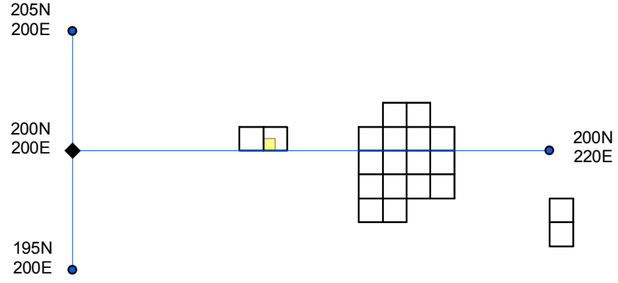
Golder Associates
Saskatoon, Saskatchewan

PROJECT	08-1361-0517		FILE No.		
DESIGN			SCALE AS SHOWN	REV.	0
GIS	DHGH	01/06/09	**APPENDIX: B7**		
CHECK	PY	09/02/10			
REVIEW	BN	09/02/10			

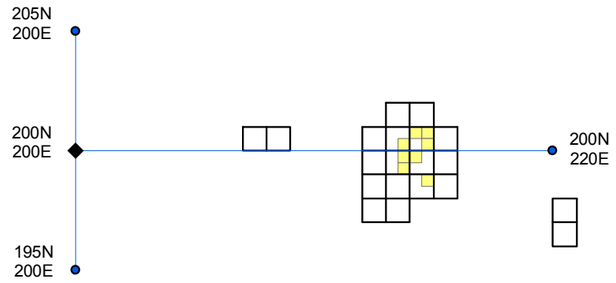
G:\2008\1361\08-1361-0517 ShoreGold Heritage Baseline\GIS\08-1361-0517-Figure B7-FhNe120 Heritage Site Catalogue.mxd



Lithic



Fire-Cracked Rock



Faunal

5 0 5

SCALE 1:250 METRES

Legend

- Site Datum
- Datum Grid
- Contour - 1M
- Unit Boundary

Frequency

- 1 - 50
- 51 - 100
- 101 - 150
- 151 - 200
- > 200

UNIT	TOTAL LITHIC	TOTAL FCR	TOTAL FAUNAL	UNIT	TOTAL LITHIC	TOTAL FCR	TOTAL FAUNAL
196N 220E	5	-	-	199N 214E	50	-	2
197N 212E	111	-	-	199N 215E	44	-	-
197N 213E	83	-	-	200N 207E	40	-	-
197N 220E	6	-	-	200N 208E	92	1	-
198N 212E	222	-	-	200N 212E	225	-	-
198N 213E	109	-	-	200N 213E	161	-	5
198N 214E	63	-	1	200N 214E	72	-	31
198N 215E	37	-	-	200N 215E	55	-	-
199N 212E	357	-	-	201N 213E	158	-	-
199N 213E	161	-	55	201N 214E	71	-	-

Reference:
Contours derived from ShoreGold LiDAR Survey
Datum Grid on True North
NAD83 UTM Zone13

PROJECT
SHORE GOLD INC.

TITLE
FhNe 138

Golder Associates
Saskatoon, Saskatchewan

PROJECT	08-1361-0517		FILE No.		
DESIGN			SCALE AS SHOWN	REV.	0
GIS	DHGH	01/06/09	**APPENDIX: B8**		
CHECK	PY	09/02/10			
REVIEW	BN	09/02/10			

G:\20081361\08-1361-0517 ShoreGold Heritage Baseline\GIS\08-1361-0517-Figure B8-FhNe138 Heritage Site Catalogue.mxd

Mitigation Permit No. 08-145

Tool Attributes

FhNe 11

Catalogue No.	Tool Type	Weight (g)	Max. Length	Shoulder (Max.) Width	Base Width	Base Height Left	Base Height Right	Notch Width Left	Notch Width Right	Notch Depth Left	Notch Depth Right	Thickness
178	End/Side Scraper	1.32	17.38	12.23	n/a	n/a	n/a	n/a	n/a	n/a	n/a	6.03
1993	End Scraper	0.97	16.87	15.02	n/a	n/a	n/a	n/a	n/a	n/a	n/a	4.1
2168	Hanna/Duncan Point Base*	1.49	12.63	n/a	17.74	n/a	n/a	n/a	n/a	n/a	n/a	6.07
4909	End/Side Scraper	3.21	24.46	17	n/a	n/a	n/a	n/a	n/a	n/a	n/a	9.16
4749	Biface	19.47	55.7	30.82	n/a	n/a	n/a	n/a	n/a	n/a	n/a	13.8
5075	Scraper Preform	9.11	34.37	20.91	n/a	n/a	n/a	n/a	n/a	n/a	n/a	12.75
6671	Biface	69.79	78	52.84	n/a	n/a	n/a	n/a	n/a	n/a	n/a	15.37
6844	Projectile Point Preform	6.62	30.65	24.8	n/a	n/a	n/a	n/a	n/a	n/a	n/a	9.6
7345	End Scraper	3.8	29.08	20.24	n/a	n/a	n/a	n/a	n/a	n/a	n/a	6.33
7346	End Scraper	3.9	29.96	19.47	n/a	n/a	n/a	n/a	n/a	n/a	n/a	7.1
7365	Biface*	18.6	40.82	41.86	n/a	n/a	n/a	n/a	n/a	n/a	n/a	15.52
9902	Biface*	22	61.71	39.79	n/a	n/a	n/a	n/a	n/a	n/a	n/a	8.31
9903	End Scraper	8.6	30.4	25.53	n/a	n/a	n/a	n/a	n/a	n/a	n/a	11.74
9904	End Scraper	3.7	21.9	16.76	n/a	n/a	n/a	n/a	n/a	n/a	n/a	8.41
9935	End Scraper	3.6	21.01	19.05	n/a	n/a	n/a	n/a	n/a	n/a	n/a	9.31
9938	Biface Fragment*	22.9	50.67	42.79	n/a	n/a	n/a	n/a	n/a	n/a	n/a	11.2
10019	Point Base*	1.3	13.74	15.35	n/a	n/a	n/a	n/a	n/a	n/a	n/a	7.34
10020	Biface Fragment*	4.7	20.13	27.41	n/a	n/a	n/a	n/a	n/a	n/a	n/a	7.83
10137	End Scraper	5.3	24.14	18.24	n/a	n/a	n/a	n/a	n/a	n/a	n/a	10.26
11872	Biface Fragment*	14	37.45	30.37	n/a	n/a	n/a	n/a	n/a	n/a	n/a	9.62
11957	End/Side Scraper	5.5	23.26	21.96	n/a	n/a	n/a	n/a	n/a	n/a	n/a	10.15
12978	End Scraper	1.4	15.72	17.91	n/a	n/a	n/a	n/a	n/a	n/a	n/a	5.2
13697	End Scraper	4.9	22.5	19.23	n/a	n/a	n/a	n/a	n/a	n/a	n/a	10.46
13744	Biface	57.5	75.65	37.84	n/a	n/a	n/a	n/a	n/a	n/a	n/a	20.67
14906	End Scraper	4	21.43	18.05	n/a	n/a	n/a	n/a	n/a	n/a	n/a	8.31
15730	M.U.R.L.	4.3	29.41	20.03	n/a	n/a	n/a	n/a	n/a	n/a	n/a	6.85
17970	Biface Fragment*	9.6	27.45	31	n/a	n/a	n/a	n/a	n/a	n/a	n/a	10.1
17971	Biface	55.5	65.66	49.25	n/a	n/a	n/a	n/a	n/a	n/a	n/a	17.34
20157	Biface	17.2	61.19	27.56	n/a	n/a	n/a	n/a	n/a	n/a	n/a	11.69
21752	Biface Fragment*	14.6	43.77	26.43	n/a	n/a	n/a	n/a	n/a	n/a	n/a	13.46
24738	Biface Fragment*	3.4	19.37	27.28	n/a	n/a	n/a	n/a	n/a	n/a	n/a	7.65
26435	Hanna Point	3.3	27.02	18.19	n/a	n/a	9.02	10.99	7.73	2.89	2.63	6.95
26436	Pecking Stone	328.7	88.76	60.62	n/a	n/a	n/a	n/a	n/a	n/a	n/a	38.54

* Tool has been broken.

Mitigation Permit No. 08-145

Tool Attributes

FhNe 88

Catalogue No.	Tool Type	Weight (g)	Max. Length	Shoulder (Max.) Width	Base Width	Base Height Left	Base Height Right	Notch Width Left	Notch Width Right	Notch Depth Left	Notch Depth Right	Thickness
373	Oxbow Preform*	5.3	40.85	20								8.14
1955	Projectile Point Base*	0.7	8.74	11.3	14.78	2.23	3.7	n/a	n/a	2.2		4.73
2142	Broken Point or Preform*	1	24.96	14.16								3.18
2641	Point Base	0.6	8.82		13.24							5.55
3712	Late Side-Notched Point	2	28.39	13.95	12.94	1.74	2.65	5.56	5.61	1.56	1.49	5.05
3713	Late Side-Notched Point *	1.2	22.33	13.21	11.11	n/a	2.59	4.55	5.81	1.9	1.8	4.24
4305	Point Distal End*	2	27.78	18.9								4.79
5411	Projectile Point Preform	3.3	38.39	20.9								5.31
6124	pelican lake point	2.5	37.06	18.79	16.51	2.37	2.91	6.04	5.16	4.24	4.08	4.76
6138	Hanna Point Base	1.9	16.72	18.58	11.93	n/a	n/a	8.57	8.8	2.4	2.82	5.82
6417	Hanna Point	4	31.09	17.02	12.97			6.17	8.08	1.69	2.13	8.45
8982	Hanna Point	5.9	38.22	19.04	15.13			9.56	7.8	2.07	2	11.58

* Tool has been broken.

Catalogue No.	Tool Type	Weight (g)	Max. Length	Max. Width	Thickness
511	Biface Preform	9.1	25.15	25.66	11.01
1956	Retouched Flake Uniface	32.9	76.65	60.28	7.37
1957	End Scraper Preform	3.3	21.2	26.94	6.68
2862	Biface Distal Fragment*	104.7	75.94	63.93	24.13
3037	Hammerstone Fragment*	62	67.84	57.41	17.11
3153	Retouched Flake Fragment*	9.3	36.71	38.69	6.15
3154	M.U.R.L.	0.9	19.74	11.55	3.59
3706	Anvil/Hammerstone	673.4	107.55	105.64	45.17
3983	retouched flake	7.2	41.46	30.6	6.49
3985	Hammerstone Fragment	1069.3	129.28	81.29	64.73
6108	Biface Fragment*	21.3	27.19	47.92	15.06
6130	End Scraper	2.7	22.72	15.39	9.06
6143	Retouched Flake Fragment*	2.9	21.66	19.47	5.73
6497	Biface Fragment*	4	23.97	27.31	7.08
6543	Biface Fragment*	4.5	22.16	19.97	7.8
6575	End Scraper Fragment*	0.7	9.02	15.89	4.44
6607	Bifacial Preform	8.7	33.34	27.51	10.21
6861	Biface Fragment*	10.6	22.66	38.01	12.88
6973	End Scraper	1.4	21.36	12.3	6.39
8981	End Scraper	2.5	21.14	18.65	5.89

* Tool has been broken.

Mitigation Permit No. 08-145

Tool Attributes

FhNe 14

Catalogue No.	Tool Type	Weight (g)	Max. Length	Max. Width	Base Height Left	Base Height Right	Notch Width Left	Notch Width Right	Notch Depth Left	Notch Depth Right	Thickness
129	Biface Fragment*	4.7	22.17*	30.38*	n/a	n/a	n/a	n/a	n/a	n/a	7.19

* Tool has been broken.

FhNe 31

Catalogue No.	Tool Type	Weight (g)	Max. Length	Max. Width	Base Height Left	Base Height Right	Notch Width Left	Notch Width Right	Notch Depth Left	Notch Depth Right	Thickness
161	Side Scraper	5.13	29.78	19.16	n/a	n/a	n/a	n/a	n/a	n/a	8.25

FhNe 45

Catalogue No.	Tool Type	Weight (g)	Max. Length	Max. Width	Base Height Left	Base Height Right	Notch Width Left	Notch Width Right	Notch Depth Left	Notch Depth Right	Thickness
12	End Scraper	5.3	40.06	16.86	n/a	n/a	n/a	n/a	n/a	n/a	7.66

FhNe 49

Catalogue No.	Tool Type	Weight (g)	Max. Length	Shoulder Width	Base Width	Base Height Left	Base Height Right	Notch Width Left	Notch Width Right	Notch Depth Left	Notch Depth Right	Thickness
619	Projectile Point Base*	0.6	7.8*	n/a*	17.09	3.77	4.28	n/a*	n/a*	n/a*	n/a*	4.3*

* Tool has been broken.

FhNe 74

Catalogue No.	Tool Type	Weight (g)	Max. Length	Max./Shoulder Width	Base Width	Base Height Left	Base Height Right	Notch Width Left	Notch Width Right	Notch Depth Left	Notch Depth Right	Thickness
287	Bifacial Preform*	19.32	35.03	36.57	n/a	n/a	n/a	n/a	n/a	n/a	n/a	12.71
401	Biface Fragment*	2.49	33.19	10.65	n/a	n/a	n/a	n/a	n/a	n/a	n/a	8.51
612	Hammerstone	381.26	80.38	74.38	n/a	n/a	n/a	n/a	n/a	n/a	n/a	41.36
1030	Projectile Point Preform	6.3	34.54	25.27	n/a	n/a	n/a	n/a	n/a	n/a	n/a	7.57
1254	Biface Preform	40.2	55.99	40.63	n/a	n/a	n/a	n/a	n/a	n/a	n/a	21.11
1255	Biface Preform*	16.3	30.13	35.64	n/a	n/a	n/a	n/a	n/a	n/a	n/a	14.84

* Tool has been broken.

FhNe 82

Catalogue No.	Tool Type	Weight (g)	Max. Length	Shoulder Width	Base Width	Base Height Left	Base Height Right	Notch Width Left	Notch Width Right	Notch Depth Left	Notch Depth Right	Thickness
31	Projectile Point *	2.7	29.28	18.78*	11.28	n/a	n/a	4.83	7.55	1.49	2.95	6.14
69	End Scraper	1	16.35	13.33	n/a	n/a	n/a	n/a	n/a	n/a	n/a	4.32
621	Biface Fragment (tip)*	0.5	13.87*	10.72*	n/a	n/a	n/a	n/a	n/a	n/a	n/a	4.3*
1057	End/Side Scraper Fragment*	1.6	23.06*	15.35*	n/a	n/a	n/a	n/a	n/a	n/a	n/a	6.17
1195	End Scraper*	1.1	15.72*	15.16	n/a	n/a	n/a	n/a	n/a	n/a	n/a	4.13
1209	Side Scraper	1.1	20.54	16.56	n/a	n/a	n/a	n/a	n/a	n/a	n/a	3.86

* Tool has been broken.

FhNe 90

Catalogue No.	Tool Type	Weight (g)	Max. Length	Max. Width	Base Height Left	Base Height Right	Notch Width Left	Notch Width Right	Notch Depth Left	Notch Depth Right	Thickness
229	Biface Fragment*	16.1	35.95*	31.52	n/a	n/a	n/a	n/a	n/a	n/a	15.55
230	End Scraper	5	24.9	22.45	n/a	n/a	n/a	n/a	n/a	n/a	9.8

* Tool has been broken.

FhNe 98

Catalogue No.	Tool Type	Weight (g)	Max. Length	Max./Shoulder Width	Base Width	Base Height Left	Base Height Right	Notch Width Left	Notch Width Right	Notch Depth Left	Notch Depth Right	Thickness
239	Retouched Flake	4	32.73	17.6	n/a	n/a	n/a	n/a	n/a	n/a	n/a	6.7
381	End Scraper	1.8	13.74	15.95	n/a	n/a	n/a	n/a	n/a	n/a	n/a	7.67
457	End Scraper	5.1	27.72	19.41	n/a	n/a	n/a	n/a	n/a	n/a	n/a	8.77
1156	Biface Fragment*	6.3	24.93	34.6	n/a	n/a	n/a	n/a	n/a	n/a	n/a	7.81
1681	Retouched Flake	27	56.34	31.4	n/a	n/a	n/a	n/a	n/a	n/a	n/a	13.54
2793	End Scraper	4.2	26.8	14.36	n/a	n/a	n/a	n/a	n/a	n/a	n/a	11.86
2792	Retouched Flake	3.1	32.26	20.24	n/a	n/a	n/a	n/a	n/a	n/a	n/a	5.07

* Tool has been broken.

FhNe 102

Catalogue No.	Tool Type	Weight (g)	Max. Length	Max Width	Base Height Left	Base Height Right	Notch Width Left	Notch Width Right	Notch Depth Left	Notch Depth Right	Thickness
286	Biface Fragment*	5.8	21.86*	24.72*	n/a	n/a	n/a	n/a	n/a	n/a	9.94

* Tool has been broken.

FhNe 115

Catalogue No.	Tool Type	Weight (g)	Max. Length	Shoulder Width	Base Width	Base Height Left	Base Height Right	Notch Width Left	Notch Width Right	Notch Depth Left	Notch Depth Right	Thickness
2061	Projectile Point	4.3	31.92	19.09	13.12	n/a	n/a	7.27	8.2	2.72	2.62	7.55
3150	Biface	25.04	54.01	38.84	n/a	n/a	n/a	n/a	n/a	n/a	n/a	13.38

FhNe 120

Catalogue No.	Tool Type	Weight (g)	Max. Length	Max./Shoulder Width	Base Width	Base Height Left	Base Height Right	Notch Width Left	Notch Width Right	Notch Depth Left	Notch Depth Right	Thickness
740	Retouched Flake	29.4	56.13	36.2	n/a	n/a	n/a	n/a	n/a	n/a	n/a	14.97
902	End Scraper	2.4	23.75	17.23	n/a	n/a	n/a	n/a	n/a	n/a	n/a	7.14
903	Projectile Point	1.7	21.06	15.59	15.56	4.37	n/a	4.31	6.26	2.23	1.04	5.2

FhNe 144

Catalogue No.	Tool Type	Weight (g)	Max. Length	Max. Width	Base Height Left	Base Height Right	Notch Width Left	Notch Width Right	Notch Depth Left	Notch Depth Right	Thickness
1	End Scraper	2	18.17	16.08	n/a	n/a	n/a	n/a	n/a	n/a	6.81

FhNe 135

Catalogue No.	Tool Type	Weight (g)	Max. Length	Max./Shoulder Width	Base Width	Base Height Left	Base Height Right	Notch Width Left	Notch Width Right	Notch Depth Left	Notch Depth Right	Thickness
2794	Retouched Flake	3.45	29.97	17.81	n/a	n/a	n/a	n/a	n/a	n/a	n/a	5.89
2843	Retouched Flake	7.56	25.25	28.16	n/a	n/a	n/a	n/a	n/a	n/a	n/a	9.67

FhNe 138

Catalogue No.	Tool type	Weight (g)	Max. Length	Max./Shoulder Width	Base Width	Base Height Left	Base Height Right	Notch Width Left	Notch Width Right	Notch Depth Left	Notch Depth Right	Thickness
130	M.U.R.L.	1.22	22.13	13.87	n/a	n/a	n/a	n/a	n/a	n/a	n/a	4.12
867	End Scraper	15.1	45.56	25.37	n/a	n/a	n/a	n/a	n/a	n/a	n/a	14
1478	Biface Preform	6.9	41.87	18.94	n/a	n/a	n/a	n/a	n/a	n/a	n/a	10.23
1513	Biface Preform	11.9	41.77	30.56	n/a	n/a	n/a	n/a	n/a	n/a	n/a	8.74